VETERINARY MEDICINE

features in this issue...

Hormones for Growing and Fattening Animals

Suffusion Method for Treating Severe Mastitis

Leptospirosis in Domestic Animals. V: Experimental Antibiotic Therapy in Chronic Bovine Leptospirosis

Environmental Anthrax in North Carolina

Use of Anrenocorticotropic Hormone (ACTH) in Small Animals

Intramuscular Use of Neomycin in the Dog

Intrathoracic Anesthesia in Cats

(Complete Index on Page VIII)

ESTABLISHED 1905

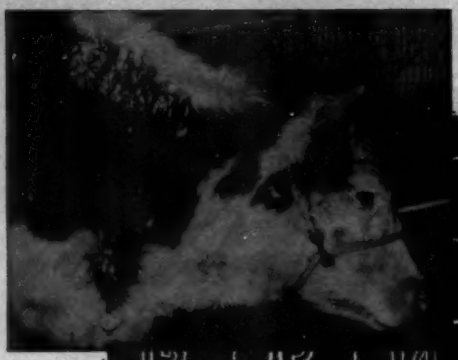
PUBLISHED MONTHLY

Entered as second-class matter September 15, 1949, at the post office at Kansas City, Mo., under the Act of March 3, 1879

$5.00 PER YEAR
50c PER COPY

SUITE 803 LIVESTOCK EXCHANGE BUILDING, KANSAS CITY 2, MISSOURI, U.S.A.

UNIVERSITY OF MICHIGAN LIBRARIES

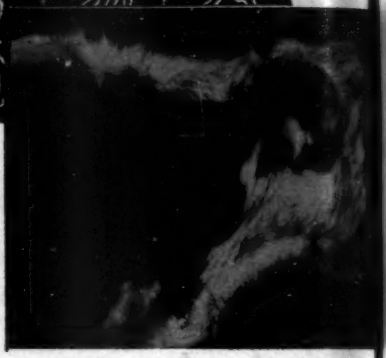


‹ from this

	WED	THUR	FRI	SAT
	1	2	3	4
	8			11
12	13	14	15	16	17	18
19	20		23	24	25
26	27	28	29	30

grow h
jection

to this ›



after 2 injections!

field reports show Jen-Sal Wart Vaccine 90% effective against virus-borne seed warts of cattle...

use Jen-Sal's exclusive chick embryo origin Canine Wart Vaccine for 100% effectiveness against virus-borne seed warts of dogs!

Good planning calls for pastured cattle to be rid of seed warts before the summer fly season begins. Field reports from cattle raising countries all over the world show that JEN-SAL CHICK EMBRYO ORIGIN WART VACCINE does the job quickly and effectively with minimum incidence of anaphylaxis (foreign protein shock). Following injection, cattle warts undergo dramatic degeneration, dropping off in three to seven weeks.

Recommended routine treatment is two 25-cc. subcutaneous injections given at ten day intervals, or a single 25-cc. injection with a simultaneous 2-cc. dose administered intradermally.

JEN-SAL BOVINE WART VACCINE (CHICK EMBRYO ORIGIN) is available in 50-cc. vials.

Jen-Sal

Jensen-Salsbery Laboratories, Inc.
Kansas City, Missouri

V
M

Hormones For Growing And Fattening Animals

CLYDE F. CAIRY,* D.V.M., M.S., East Lansing, Michigan

USE of steroid hormones for fattening cattle and sheep has created tremendous interest among feeders during recent months. As these hormones are widely-used and potent therapeutic agents, it is important that veterinarians be informed of the status of products and procedures, so that they may offer sound advice to clients.

In order to comprehend the problems involved, certain physiological considerations will be discussed. Later a series of questions and answers may serve to fill specific gaps.

It has been recognized for many years that changes in the rate and type of growth occur at sexual maturity, during pregnancy, and following castration. Females or neuters have a tendency to accumulate fat. These observations have suggested that the sex hormones (from the female particularly) might be used to induce fattening in meat animals, and as a result such agents have been administered to poultry, cattle, sheep, and swine for this purpose. The use of diethylstilbestrol in poultry is well-known and will not be considered here. The trials in swine have been disappointing to date.

Hormones presently employed in cattle and sheep are of two types: Estrogens and the corpus luteum hormone, progesterone. The ovarian follicle normally produces a powerful estrogen, estradiol, when the follicle is growing. Also, during pregnancy the placenta elaborates large amounts of estrogen. The functions of natural estrogens in the body may be summarized as effects upon:

A. Psychic manifestations. Produces sexual desire.

B. Accessory genital organs.
   1. Oviduct. Increases sensitivity.
   2. Uterus.
      a. Increases vascularity.
      b. Causes muscle to:

The author is qualified as a veterinary physiologist, pharmacologist, and endocrinologist. He has undertaken to answer questions posed most frequently concerning hormone treatment or feeding for increased gains and improved feed-use efficiency in fattening cattle and sheep.

Feeders have accepted recommendation for use of potent sex hormones following publication in the farm press of glowing experience reports. It is estimated that 40% of cattle now on feed are getting it. This prompt acceptance and utilization of experimental results is unprecedented and especially noteworthy, considering vital, unanswered questions regarding the use of these products that have recognized danger potentials to which the author refers. It has been suggested [see VETERINARY MEDICINE, 50:87 (Feb.), and 50:145 (Mar.), 1955] that practitioners proceed with caution in recommending hormone treatment. Until more is learned, discrete use appears rational. The addition of stilbestrol, or any hormone, to protein supplements of all fattening cattle managed under all sorts of conditions and variety of methods, and under existing variation of feeding programs hardly can be expected to be followed by consistent results. Consideration should be given to individual lots of animals (weight, sex, and age), ration fed, and other husbandry practices before recommending one or another of the available technics, or others that will most likely be made available in the near future.

*Professor of Physiology and Pharmacology, Michigan State University.

UNIVERSITY OF MICHIGAN LIBRARIES

(1) Grow
(2) Become more sensitive (to pitocin for example).

3. Vagina. Epithelium grows and cornifies.

C. Secondary sex characteristics.
1. Mammary gland.
a. Grows ducts.
b. Prevents lactogenic hormone action.
2. Produces female conformation.

D. Anterior pituitary.
1. Inhibits output of follicle-stimulating hormone (FSH)
a. Stops development of ova to terminate estrum.
b. Inhibits sperm cell production in male.
2. Stimulates output of luteinizing hormone (LH) which forms corpus luteum.
3. Stimulates output of luteotrophic (lactogenic) hormone, which causes corpus luteum to produce progesterone (therefore placental estrogen is needed during pregnancy).

Some of these reactions are seen at times in the fattening technics, and may be objectionable. Examples are excessive riding (sexual desire), mammary gland growth, and inhibition of estrous cycles (if animals happen to be bred later).

In some of the applications of estrogens to fattening animals, the synthetic estrogen diethylstilbestrol (stilbestrol) is used. This compound differs chemically from naturally-occurring estrogens, but physiologically it has many of the effects of estradiol. It should be remembered that they are not identical; an *in vitro* experiment[1] indicated that estrone (a natural estrogen related to estradiol) was inactivated by the liver much more easily than was stilbestrol. This may account for stilbestrol being more active by mouth than the natural estrogens.

The other hormone, progesterone, is commonly used in implants in combination with the natural estrogen, estradiol. Progesterone is normally secreted by the corpus luteum in the ovary, and is concerned with producing changes in the body which assure continuation of pregnancy. Its functions are:

A. Uterus. (Essential for gestation).
1. Inhibits uterine contractions.
2. Stimulates gland and muscle growth.
3. Sensitizes mucosa for:
a. Implantation.
b. Development of maternal placenta.

B. Mammary gland. Stimulates growth of gland cells.

C. Anterior pituitary. Suppresses estrum by inhibiting output of follicle-stimulating hormone. (Progesterone may aid ovulation in the regular cycle.)

Both the estrogens and progesterone are in finely adjusted balance with the anterior pituitary hormones. Slight changes in these balances may lead to difficulties in normal reproductive functions. For example, in many species, excessive estrogen will inhibit gonadotropic hormone (follicle-stimulating hormone) especially and thus decrease follicular growth and estradiol output in the ovary and spermatogenesis in the male. In addition, estrogens may influence other anterior pituitary hormones and thus bring about changes in the functional states of other endocrine organs, such as the adrenal and thyroid glands. There-

Fig. 1. Fattening steers on pasture do not make spectacular gains, such as do those under dry-lot conditions, when stilbestrol is added to respective rations.

fore, it should be apparent that hormone administration for any purpose is a delicate matter. Whereas, doubling the dose of some drugs will enhance the desired action, doubling the dose of hormones may not only fail to improve the response, but it may produce undesirable results as well. Some of these considerations may account for the problems that have developed in attempting to use hormones for fattening meat animals.

Questions following are those most frequently asked. An attempt has been made in preparing answers to bring readers up-to-date in regard to the status of products and procedures recommended for their use and, in general, what may be expected from the use of agents presently available or that may be available in the future.

Questions and Answers

1. *What hormones are used on which species and how? What procedures have been approved by the Federal Food and Drug Administration?*

From an experimental standpoint, two methods of administration have been used; namely, pellet implants and through feed. By eliminating methods and species in which adverse results were obtained, we arrive at the two procedures which are so far approved by the Federal Food and Drug Administration. This agency has authorized the feeding of stilbestrol to cattle being fattened for slaughter, and the implanting of a combination of estradiol and progesterone in lambs. The procedure authorizing the use of stilbestrol in cattle is work patented by the Iowa State College Research Foundation. The Eli Lilly Company, Indianapolis, Ind., is licensed to manufacture a "premix", which is then sold to reputable feed manufacturers. The premix is incorporated into the supplements sold by these manufacturers in such proportions that each two pounds of the supplement (for feeding) contains 10 mg. of stilbestrol. This represents the recommended daily dose for cattle. The final feed supplement offered for sale is to be used only for cattle intended for slaughter.

In lambs, the Food and Drug Administration has authorized the use of pellets containing a combination of 250 mg. of progesterone and 10 mg. of estradiol. These have been made available on the market as synovex® pellets. They are implanted subcutaneously on the ventral surface of the lower jaw. They are not removed but remaining unabsorbed portions are discarded at the time of slaughter.

Implanting stilbestrol in cattle, rather than feeding, led to some benefits and some undesirable results[3]. Steers and heifers implanted with 60 or 120 mg. of stilbestrol, demonstrated increased efficiency of feed utilization, and an increased rate of gain, but there was a lowering of carcass grade (less marbling, coarser and darker meat, less internal and external fat, "staggy" conformation). In addition, excessive riding was observed and in some heifers prolapse of the vagina occurred. Mammary glands were developed both in steers and in heifers. Some of these responses are attributed to the productions of adrogens (male hormones) by the adrenal glands.

Implanting of estrogen (stilbestrol) alone in fattening lambs has resulted in an increased rate of gain and improved feed efficiency[3]. However, carcass quality was lowered markedly. In a band of 9,000 lambs implanted, about 2,000 died from blockage of the urinary tract; many wether lambs developed prolapse of the rectum, and many of the ewe lambs developed prolapse of the uterus and vagina. These objectionable effects were not observed in the original experiments when the combination of progesterone and estradiol was implanted, although enlargement of some of the accessory genital organs was reported[4,5].

Feeding stilbestrol to lambs gives increased gains at some levels of hormone,[6] but the optimum level has not been determined. Carcass quality was reported to hold up.

In swine, experimental results have been disappointing[7,8,9,10]. None of the following has proved consistently effective in improving growth rate or feed efficiency (feed efficiency was improved in one report[6]): Implants of stilbestrol, testosterone (male hormone); feeding of stilbestrol or testosterone; injections of estradiol, testosterone, or a combination of the two. Stimulation of the genitalia was reported in both gilts and barrows, as was uterine prolapse in gilts.

2. *What precautions are being taken to make sure that procedures which are not approved are not used?*

While to date the only approved procedures are the feeding of stilbestrol to cattle intended for slaughter and the implanting of progesterone with estradiol into lambs for fattening, it is left to the honesty of people in general to restrict these products to use in these two ways. It seems questionable that this is an adequate safeguard at this time when possible harmful

®Syntex Animal Products, 10 East 40th Street, New York 16, N. Y.

UNIVERSITY OF MICHIGAN LIBRARIES

effects are not entirely known. It is stated on the feed-bag tags that stilbestrol feeding should be discontinued 48 hours before selling cattle. This may be disregarded by some individuals.

3. *What are the benefits?*

Two main benefits may be expected: Increased rate of gain is first. Hormone treated cattle gain weight about 0.3 to 0.75 lb. per day faster than controls. This reduces feeding time approximately 20%. In lambs, the saving in time may be even greater. The second benefit is increased feed efficiency. While cattle and lambs eat more feed per day, they eat less feed per pound of gain. Representative figures in cattle show it took 9.4 and 9.95 lb. of feed for each pound of gain in controls, but only 7.56 and 8.8 lb. in stilbestrol-fed cattle[12,18]. In lambs on some diets, untreated animals required 7.5 and 9.7 lb. of feed per pound of gain. Implanted lambs required 6.35 and 7.46 lb. respectively[4,8]. These figures indicate a savings in feed cost of from 11 to 22%.

4. *What are objectionable effects?*

In addition to the possible lowering of carcass quality (see question 12), the main difficulties have been excessive riding, nervousness, and mammary gland development in cattle, and blockage of the urinary tract and difficult pelt removal in lambs. These objectionable features are not as important in cattle as in sheep.

The excessive riding and nervousness are associated with a direct estrogen action or perhaps with male-type hormone production by the adrenal cortex. The development of the mammary glands, even in steers, has made them appear better finished.

The difficulties in lambs are mainly associated with enlargement of the urogenital organs (primarily the bulbo-urethral gland in wethers)[13,14] so that the urethral lumen is reduced in size. This allows calculi to lodge more readily and at best creates difficulty in urination. This leads to straining and consequent prolapse of the uterus, vagina, or the rectum, and even to death[3,14].

Difficulty in removing lamb pelts has also been reported[13]. This is probably due to excessive amounts of connective tissue laid down beneath the skin.

5. *What causes the effects on growth?*

Several explanations of the effect on growth have been advanced. One suggested mechanism, by Clegg and Cole,[5] is that the estrogen causes the anterior pituitary to secrete adrenocorticotropic hormone (ACTH) and that this in turn stimulates the adrenal cortex to secrete androgens (male hormones). This view is supported by the finding of male-like hormones in the urine of stilbestrol-implanted lambs[16]. The male hormone would be responsible for the growth effect and also for some observed male reactions such as excessive riding, bellowing, and the enlargement of many accessory genital organs. The data reported in the above paper have also been interpreted[16] to mean that estrogens cause an increase in output of growth hormone from the anterior pituitary. Another idea is that stilbestrol, in the feed at least, increases digestion of cellulose in the rumen. This was observed in artificial rumina[17]. There are, however, many reports[8,15,19] that implants of stilbestrol do not increase digestibility of feed.

Other suggestions are that by some means nutrients are used more efficiently after absorption, or that there is a change in the composition of the added weight[20].

Additional work is necessary before a complete explanation of the effects on growth is developed.

6. *What makes up the increased weight gain?*

The extra weight does not appear to be water, as is indicated by cooler shrink data and actual determinations of water content of the carcass[3,5,21,22,23].

Experimental results reveal that there is an increase in the protein content of the meat. Two reports[3,5] reveal nitrogen retention which suggests protein being laid down. Another[22] in which stilbestrol was implanted in steers (not fed) reports a greater percentage of lean and a smaller percentage of fat in a seventh-rib cut, along with a greater area of the eye muscle. In a recent experiment at Michigan State University[21], steers fed stilbestrol had the same percentages of lean, fat, and bone, but steers implanted with a progesterone-estradiol combination had a higher percentage of lean and a lower percentage of fat. In another instance[24] it was reported that stilbestrol implants tend to cause deposition of fat in bulls, but to retard it in steers.

These results are merely suggestive and serve to indicate the complexity of the problems which result when so many variables (hormones used, route of administration, status of the gonads) are present.

7. *Are the effects the same in male and female animals of all ages?*

In cattle, stilbestrol feeding to heifers has not given results equal to those obtained with steers[11]. Heifers nevertheless respond by increased rate of gain and feed-use efficiency.

Stilbestrol implants in heifers have likewise shown less response than in steers[5]. It is believed that heifers may be less responsive to estrogen or that the estrogen they produce themselves, added to that in the implants, may effect an inhibitory response on growth.

Size or age of cattle appears to make little difference. Most of the experimental results are from cattle between 600 and 1,200 lb. Some weighing less than 600 lb. indicated a favorable response.

In lambs, both sexes appear to respond alike to stilbestrol implants[25]. However, different results are reported as to age. Two experiments[5,25] found no effect from stilbestrol implants in suckling lambs weighing about 25 lb. and 40 lb. respectively. Others[25,27] report increased rate of gains in suckling lambs weighing 46 lb. and 20 lb. respectively. The manufacturers of progesterone-estradiol pellets recommend they be used in lambs weighing between 60 and 70 lb.

8. *How long should stilbestrol be fed to cattle? How long should the combination pellet treatment be used in lambs?*

In cattle, it appears that benefits are derived from stilbestrol at any period during their feeding. However, the greatest gains are expected early in the feeding period. Feeding trials as long as 243 days have been reported. It is generally recommended that feeding, once started, be continued until 48 hours before marketing.

The recommended procedure in lambs is to implant when weights of 60 to 70 lb. are attained. Pellets are left *in situ* until lambs are slaughtered.

9. *What are the effects of different feeds on the results?*

Most reports indicate that in cattle improved gains are found on almost any ration. However, high energy rations give the most marked results. On pasture alone, treated heifers and steers show a gain, but a poor one (the heifers respond less than the steers). Since the pasture may supply some estrogenic substances, (the heifers might also), and since the two pounds of supplement may supply too much protein, the feeder might reduce the supplement. This raises the question as to how much estrogen animals are actually getting. This problem illustrates the unanswered questions developing every day.

Lambs appear to utilize pasture better than cattle, and have shown good gains from implanted stilbestrol (without progesterone)[5].

10. *Are all the supplements containing stilbestrol alike?*

No, they differ just as much from each other as they did before stilbestrol was added. The choice of a supplement should be based, as before, on the other feeds being given. In order to make for less confusion, all supplements must contain 5 mg. of stilbestrol per pound, and each animal is to get two pounds of supplement (10 mg. stilbestrol) per day. As this may not be the optimum amount of concentrate under all conditions, the Eli Lilly Company has applied for permission to allow feed manufacturers to vary stilbestrol content between 2.5 and 10 mg. per pound. This will add to the difficulty of proper use and control of these products.

11. *When they are fed, how do we know each animal gets the correct amount?*

We do not know for certain that each animal will get his share. This would be one advantage of the implant method over feeding. Since it is obvious that some animals eat more, it might be expected that the ones who eat the most at first would get more stimulus to their appetite and eat still more. Thus some individuals might get twice as much as the average and some others might get only a fraction of the intended dose. If there are bad effects, this might explain why certain individuals exaggerate them.

12. *What are the effects on carcass quality, and what is the buyer's attitude in the stockyards?*

Reports of implanting lambs with stilbestrol alone or in combination with progesterone in a ratio of about 1:10 indicate that carcass grade is lowered from slightly to considerably[5,14,25,29]. Feeding of stilbestrol has also lowered carcass quality (Michigan State University unpublished data[13]).

Some reports of the authorized implanting procedure (progesterone—estradiol ratio of 25:1) indicated that carcass quality was equal to controls[4,5,20]. A more recent experiment at Michigan State University (unpublished data) indicated that when lots were "topped out" (sold when they reached 110 lb. or when they

UNIVERSITY OF MICHIGAN LIBRARIES

reached choice grade), carcass quality fell. However, this decline was more than overcome by the increased rate of gain. An extra profit was still realized. Another report[13] indicates that the market value of implanted lambs was much less than controls, not due to excessive weight, but due to shape of the carcass, color and texture of the meat, and appearance of the bone. It is suggested that blockier, shorter-legged lambs might have come through better. Considerable difficulty was experienced in removing the pelts from these implanted lambs, due apparently to excessive amounts of connective tissue beneath the skin. In cattle on the stilbestrol-feeding program, most reports indicate no significant lowering of carcass grade [21, 22, 23] in two experiments quality was lowered by one-third of a grade [24]. A recent experiment [21] at Michigan State University produced these results:

	Controls	10 mg. stilbestrol per day in feed	1.5 gm. progesterone and 0.05 gm. estradiol implanted
High choice	1	3	0
Ave. choice	1	3	3
Low choice	7	5	3
High good	3	1	7
Ave. good	2	0	1
Low good	0	0	0

These results are not significantly different from each other, and they would indicate that there is some promise in a combination implant, since the implanted steers had a higher rate of gain (3.03 lb. per day) than either the stilbestrol fed (2.64 lb. per day) or the controls (2.30 lb. per day). The implanted steers made these gains on 21% less feed than the controls. Stilbestrol-fed steers made their gain on 11% less feed than the controls.

In an earlier experiment[25] at Michigan State University, implanting a combination of progesterone and stilbestrol at a ratio of 10:1 and with the steers on pasture, resulted in marked lowering of carcass grade. A later trial[26] using these same hormones but at a ratio of 30:1, with the steers in dry lot, showed no lowering of carcass quality. It should be noted that in the preceding paragraph the hormone combination was progesterone: estradiol at a ratio of 30:1, not progesterone: stilbestrol as in this report.

Implanting of stilbestrol alone[23] resulted in increased rate of gains with no difference in carcass grade.

As regards the buyers' attitude, some have lowered the price paid when they could recognize the treated animals (from raised tailheads or "depression of the loin") on the possibility that they would "look better" than they dressed out. It appears to be difficult to detect the treated animals with certainty, and if this is true, discrimination against these animals should become less common.

13. *Is there a difference in dressing percentage and in cooler shrinkage?*

Dressing percentage is reduced slightly in lambs[3, 5, 14]. Cooler shrink is a little greater in lambs[3, 5].

In cattle, there appears to be no difference in dressing percentage as a result of feeding stilbestrol[22, 21, 23, 24] (or from progesterone-estradiol implants[21]). Cooler shrink in cattle is reported as unaffected[21, 23].

14. *What objectionable effects might be expected from overdosage or accidental eating?*

Fig. 2. Factors concerned with quality of rations influence record of gain, regardless of hormone supplementation.

There appears to be an optimum level of these hormones for producing the best gains. If this amount is exceeded, poorer gains result.

Presently authorized procedures confine the use of these products to lambs and to cattle being fattened for slaughter. If other animals get some of the material, serious upsets, in reproduction especially, could develop, due to hormone imbalances. In the regular reproductive cycles, estrogen and progesterone are alternately important. Estrogen predominates during proestrum and estrum; progesterone is most active during metestrum and diestrum. During pregnancy, both hormones are active and useful. The upsetting of these relationships by a sustained level of these hormones in the body may have serious consequences as far as breeding efficiency is concerned. Certain levels of estrogen are also inhibitory to lactation. For these seasons, it is important that breeding stock, show animals, dairy cows, and any others not intended for slaughter be prevented access to these products. Uninformed owners may decide to "fleshen up" their breeding stock or show animals, but until these procedures are proved harmless, they should be avoided.

15. What are the chances other animals may get the hormone, such as from pigs following cows, and from feeding animal products to mink or to fox?

While it appears unlikely that permanent damage would result from the amount of estrogen pigs might pick up, gilts have been reported by some farmers to fail to come in heat when following cows being fed stilbestrol. It is therefore recommended that bred sows and gilts not be allowed to follow cattle.

Mink breeders especially had extensive abortions following the feeding of heads from stilbestrol treated poultry. They are therefore suggesting that tripe from treated cattle not be fed to mink until it can be shown not to be harmful.

16. *What are the possible effects of eating meat from treated animals?*

In order to answer this, three other questions must be considered: Is there any hormone residue in the meat? If so, is it sufficient to be detrimental? Could these hormones produce substances, other than hormones, which might be injurious?

Reports indicate that estrogens are present in the meat of steers, wethers, and chickens implanted with synthetic estrogens[24]. It is probable that the amount in beef muscle and liver does not exceed 0.01 micrograms per gram of dried tissue. In the case of sheep muscle and chicken meat, the amount is probably not more than 0.1 micrograms per gram of dried tissue.

Whether or not this amount would be detrimental over a long period can not be judged without trying it. Assuming that all of one's meat may come from hormone-treated animals, and that one is on this regime for many years, it seems possible, although not probable, that reproductive processes in man could be disturbed. It would take about 22 lb. of meat to supply 1 mg. of stilbestrol. This amount (1 mg.) is an average human daily therapeutic dose. Human beings tolerate stilbestrol well, and many times the above dose has been taken with no adverse effects. In addition, it should be pointed out that estrogens also occur in natural foodstuffs (potato, oats, egg yolk, clover hay, soy-bean oil meal, alfalfa hay, pasture grasses). Thus we, or the meat we eat, have all been subjected to small amounts continuously. In spite of these facts, it may not be safe to say that adverse effects from hormones in the meat are impossible.

Perhaps a more important question is the possibility of adverse effects from new substances formed or from breakdown products of hormones. While the writer has no information to indicate that such is the case, it seems we are assuming that if no hormone residue is found or if negligible amounts are found, that no further evidence of lack of toxicity is needed. In all probability, this will turn out to be true, but at this stage perhaps we should raise the question and answer it by saying, "We don't know".

Conclusion

It is apparent from the foregoing discussion that there are many partially answered or unanswered questions. This is a relatively new technic, and it will be some time before the best procedure in each species and for each set of conditions can be determined. There are so many variables which must be considered that it is imperative that we proceed with caution. Among the many variables which should be worked out are:

1. The hormones to be used and the ratio of one to another if in combination.
2. How they are to be given.
3. Species differences in response.
4. Sex differences.
5. Age of animals.

UNIVERSITY OF MICHIGAN LIBRARIES

6. How long they should be under treatment.

7. The type of feed being used.

8. Seasonal variations in response.

In addition, the possibility of unforeseen effects in man, when subjected to meat from hormone-treated animals, can not be dismissed lightly. Only time will answer conclusively this point. Other problems, suggested by questions above, and which need further work, are the effects on other species such as swine following cows, and the effects on fur-bearing animals if they are fed offal from treated animals. Still others may include the possibility that the extra meat laid down is lacking in some essential food element, or that it may contain new compounds which are injurious to health. It does not seem likely that any of these suggested possibilities will be troublesome, but it is believed these questions deserve an answer as soon as possible. Otherwise, serious results may follow the widespread use of these procedures.

It seems certain that these technics are the coming thing in animal feeding, but a statement attributed to Secretary of Agriculture Benson, that, "It's an age of chemistry . . . 25c worth of hormones may put $25. worth of beef on a steer", appears to be too optimistic. It is not as simple as that. In consideration of advancement of understanding in these matters to date, it is recommended that careful consideration be given all possible aspects of the problem as might pertain in a specific herd or group of animals. Furthermore, that use of these hormonal agents be expanded slowly and as information concerning their action is made available by studious research.

REFERENCES

1. Zondek, B., Sulman, F., and Sklow, J., Inactivation of Stilbestrol by Liver *in vitro*. *Endocrinology*, 33:333, 1943.

2. Clegg, M. F., and Cole, H. H., The Action of Stilbestrol on the Growth Response of Ruminants. *Jour. An. Sci.*, 13:108, 1954.

3. Jordan, R. M., Effect of Stilbestrol on Suckling and Fattening Lambs. Animal Husbandry Department, Michigan State University, 1952.

4. Mimeographed report. Results of Implanting Steroid Hormones in Western Feeder Lambs. Animal Husbandry Department, Michigan State University, 1952.

5. Mimeographed report. Results of Implanting Progesterone and Estradiol in Western Feeder Lambs. Animal Husbandry Department, Michigan State University, 1954.

6. Hale, W. H., Story, C. D., Culbertson, C. C., and Burroughs, Wise, Responses of Lambs Fed Varied Levels of Diethylstilbestrol. *Jour. An. Sci.*, 13:985 (Abstr.), 1954.

7. Woehling, H. L., Wilson, George D., Grummer, R. H., Bray, R. W., and Casida, L. E., Effects of Stilbestrol and Testosterone Pellets Implanted into Growing Fattening Pigs. *Jour. An. Sci.*, 10:889, 1951.

8. Dinusson, W. E., Klosterman, Earle W., and Buchanan, M. L., Stilbestrol: Effect of Subcutaneous Implantation on Growing Fattening Swine. *Jour. An. Sci.*, 10:885, 1951.

9. Perry, T. W., Beeson, W. M., and Andrews, F. N., The Effect of Stilbestrol and Testosterone on Growth and Carcass Quality of Swine. *Jour. An. Sci.*, 13:995, 1954.

10. Sleeth, R. B., Pearson, A. M., Wallace, H. D., Kropf, D. H., and Koger, Marvin, Effects of Injection of Testosterone, Estradiol and a Combination of the Two upon Growing-Fattening Swine. *Jour. An. Sci.*, 12:322, 1953.

11. Burroughs, Wise, Culbertson, C. C., McWilliams, R. M., Kastelic, Joseph, and Reber, H. W., Hormone Feeding (Diethylstilbestrol) to Fattening Heifers. Iowa State College, A. H. Leaflet 192, 1954.

12. Burroughs, Wise, Culbertson, C. C., Kastelic, Joseph, Hammond, W. E., Cheng, Edmund, Hormone Feeding (Diethylstilbestrol) to Fattening Cattle II. Iowa State College, A. H. Leaflet 189, 1954.

13. Acker, Duane, Whiteman, J. V., Gallup, W. D., and Tillman, A. D., Effects of Certain Hormones on Feed Digestibility, Feed Lot Performance, and Carcass Quality of Lambs. Feeders Day Reports—1955. Agricultural Experiment Station, Oklahoma A. and M. College, Stillwater, No. 42, 1955.

14. Bell, T. D., Smith, W. H., and Erhart, A. B., The Effect of Stilbestrol upon Lamb Performance in the Feedlot. *Jour. An. Sci.*, 13:425, 1954.

15. Ruliffson, W. S., Bell, T. D., Hughes, J. S., and Nunn, A., Neutral 17-ketosteroids in the Urine of Normal and Diethylstilbestrol Treated Wether Lambs. *Jour. An. Sci.*, 13:1030, 1954.

16. Lorenz, F. W., The Effects of Estrogens on Domestic Fowl and Applications in the Poultry Industry. Vitamins and Hormones, Volume XII:235. New York, Academic Press, Inc., 1954.

17. Brooks, C. C., Garner, G. B., Muhrer, M. E., and Pfander, W. H., The Effect of Fat and Diethylstilbestrol on Cellulose Digestion by Sheep Rumen Microorganisms. *Jour. An. Sci.*, 12:909, 1953.

18. Jordan, R. M., and Bell, F. Donald, Effect of Stilbestrol on Carcass Quality and Shrinkage and Nitrogen Retention by Lambs. *Jour An. Sci.*, 11:795 (Abstr.), 1952.

19. Whitechair, C. K., Gallup, W. D., and Bell, M. C., Effect of Stilbestrol in Ration Digestibility and on Ca, P, and N Retention in Lambs. *Jour. An, Sci.*, 12:331, 1953.

20. Wilkinson, W. S., Pope, A. L., Phillips, P. H., and Casida, L. E., The Influence of Diethylstilbestrol on Certain Blood and Liver Constituents of Lambs. *Jour. An. Sci.*, 13:684, 1954.

21. Deans, R. J., Van Arsdell, W. J., Reineke, E. P. and Bratzler, L. J., Hormone Feeding Report, Michigan Agricultural Experiment Station, June 13, 1955.

22. Deans, R. J., Van Arsdell, W. J., Reineke, E. P., and Bratzler, L. J., The Effect of Progesterone-Stilbestrol Implants on Rate of Gain and Carcass Characteristics of Steers. *Jour. An. Sci.*, 12:901, 1953.

23. Clegg, M. T., and Carroll, F. D., Further Studies on the Anabolic Effects of Stilbestrol in Steers as Indicated by Carcass Composition. *Jour. An. Sci.*, 13:968, 1954.

24. Cahill, V. R., Klosterman, E. W., Deatherage, F. E., and Kunkle, L. E., The Possible Functions of Diethylstilbestrol as Observed in Beef Carcass Evaluation and Certain Associated Glands. *Jour. An. Sci.*, 13:968, 1954.

25. Clegg, M. T., Albaugh, Reuben, Lucas, Joseph,

(Continued on page 372)

The Suffusion Method For Treating Severe Mastitis

GAIL E. HAWLEY,* D.V.M., Terre Haute, Indiana

THE treatment of severe infections of secretory organs often requires systemic medication. Thus, Schipper *et al.*[1,2] demonstrated the efficacy of intravenous antibiotics for the treatment of both systemic and localized mastitis. Traumatic infectious parotiditis of dogs has been treated successfully with both intravenous and intramuscular terramycin® by the writer. Numerous reports from practitioners indicate that systemic use of antibiotics at relatively high levels is effective in treating mastitis of swine and cattle, cryptic sinusitis of horses and cattle, and parasitic sinusitis of sheep.

In mixed infections, antibiotics are most effective when a high therapeutic level is provided at the site of the infection. Thus, for the treatment of traumatic or gangrenous types of infectious mastitis, vehicles for teat infusion have been devised which quickly disperse in milk to carry the therapeutic agent as completely as possible into intimate contact with the infected parts (Hawley[3]). However, Schipper[2] has shown that infusion may not always carry the antibiotic to the extreme upper levels.

To bring antibiotics to the upper part of the udder, direct injection through the udder wall, a short distance below the point of attachment of the gland, has been investigated by us.

Technic

As an aseptic precaution, the double needle method, similar to that employed by Frank[4] for paravertebral block, is used. The quarter to be treated is carefully washed with mild soap and water and dried with gauze pads. On some animals, it may be desirable to shave the hair from the upper part of the udder where it joins the body. Iodine is applied to the area where injections are to be made, which is around the periphery of the affected quarter about an inch or an inch and a half below the point of attachment.

The pilot needles (1-in.-14-gauge) are inserted about 3 in. apart around the border of the quarter to be treated, pointing toward the center where the glandular demarcation of the individual quarters would meet. (See illustrations). Individual 6-in. or 8-in. 20-gauge needles are inserted through the pilot needles toward the imaginary center point. Through these is injected a solution of intravenous terramycin comprising 1 gm. of the antibiotic

*Chas. Pfizer & Co., Inc., Agricultural Research and Development Department.
®Chas. Pfizer & Co., Inc., Brooklyn, N. Y.

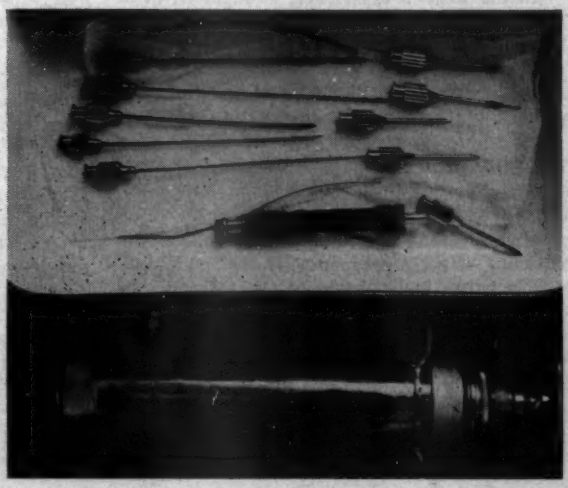


Fig. 1. Equipment required for mammary suffusion: 14-gauge pilot needles, 20-gauge injection needles, rubber coupling, syringes.

UNIVERSITY OF MICHIGAN LIBRARIES

Fig. 2. Illustrating method of placing pilot needles and making injection of aqueous solution of therapeutic agent. A normal udder is shown here for demonstration of operative technic.

in 80 cc. of sterile saline. A concentration of 12.5 mg. per cc. is sufficient and allows enough volume so that 20 cc. or more may be injected through each suffusion needle.

It is desirable to use a syringe with a freely-working plunger attached to the injection needle by a short rubber coupling. The antibiotic solution is injected slowly, as the long needle is withdrawn. One should attempt to distribute the medication as evenly as possible throughout the intraglandular spaces.

Discussion

In the writer's experience, a single series of injections into the upper part of the udder has sufficed in four severe cases of mastitis of the type in which the quarter usually is lost. These results warrant the expenditure of time (one hour) required for this method of treatment. As an auxiliary treatment, regular udder infusions of antibiotic *via* the teat canal should be continued for at least three days, depending upon the severity of the infection.

High level intraspinal block is advisable only in cases of early pregnancy. Local anesthesia was not used in our cases because of poor circulation in the affected quarter (cold udder).

Summary

A technic for suffusing the upper portion of the udder with anti-infective agents is described. The suffusion of 80 cc. of intravenous terramycin at a concentration of 12.5 mg. per cc. was efficacious in four cases of severe gangrenous mastitis.

REFERENCES

1. Schipper, I. A., and Petersen, W. E., Milk, Blood, and Urine Concentrations of Aureomycin after Intramammary Infusion and Intravenous Administration. *Vet. Med.*, 47:367, 1952.

2. Schipper, I. A., Comparison of Vehicles in Intramammary Therapy of Bovine Mastitis. *Vet. Med.*, 50:111, 1955.

3. Hawley, G. E., Administration of Antibiotics to Animals. *Vet. Med.*, 79:517, 1954.

4. Frank, E. R., Veterinary Surgery Notes. Minneapolis, Burgess Publishing Co., Rev. ed., 1947.

5. Schipper, I. A., personal communication.

▼ ▼ ▼

Easy Test for Ketosis

The so-called "denco" powder test for ketosis in cattle, the test was developed by Dr. J. Allyn Rogers of the University of Pennsylvania, is meeting with favor by veterinarians. It is proving to be a useful item for dispensing to dairyman clients. Owners can apply the simple test which involves dropping a single drop of milk from a suspected early case on the powder. A light lavender color which develops in the moistened powder is reason to suspect metabolic disturbances. It is recommended, if there is no reaction to the first test, to repeat the test every three days for two weeks after freshening. In case of a reaction, the veterinarian can be called so that treatment may be started early or at the onset of disease.

Studies On Leptospirosis In Domestic Animals. V: Experimental Antibiotic Therapy In Chronic Bovine Leptospirosis†

H. S. BRYAN, D.V.M., Ph.D., Urbana, Illinois

CHRONIC bovine leptospirosis caused by *Leptospira pomona* is regarded primarily as a disease of the kidneys. Cattle which survive a herd outbreak usually become carriers and spreaders as renal infection persists. The urine of infected animals is considered an important factor in the spread of leptospirosis to susceptible animals. To remove the danger of spread through contaminated urine, elimination of carrier animals would appear to be highly desirable. The possibility of instituting therapy as an aid in checking the carrier feature was regarded as worthy of investigation. This report deals with the experimental antibiotic therapy as applied to cows in two herds which were chronically infected with *L. pomona*. The results of blood serum agglutination-lysis tests were used, in an effort to note the effect, if any, of experimental therapy.

Literature Cited

Gsell[1] reported that prior to the advent of antibiotics many therapeutic measures were employed in the treatment of human leptospirosis. None, including the administration of sulfonamides and specific antiserum, is now used extensively in the treatment of this malady in man.

Alston and Broom[2], Chang[3], and Schlipköter[4] showed that many of the antibiotics in common clinical use today possess leptospirostatic activity *in vitro* at concentrations which can be attained in the blood of animals. In guinea pigs experimentally infected with *L. icterohemorrhagiae*, Alston and Broom[2], and Chang[3] demonstrated the beneficial effect of penicillin if administered before the appearance of jaundice. Heilman[5,6] showed that streptomycin and aureomycin[@1] appeared beneficial in treating hamsters infected with *L. icterohemorrhagiae*. Brunner and Meyer[7,8] found that streptomycin and aureomycin were possibly effective in clearing the urinary state of hamsters and dogs infected with *L. icterohemorrhagiae* and *L. canicola*. However, there seemed to be general agreement among these investigators, that after the onset of icterus in infected animals, the beneficial effect of antibiotics was markedly decreased or of questionable value.

A group of investigators[9] in human medicine studied the therapeutic effect of penicillin, streptomycin, aureomycin, terramycin,[@2] chloromycetin,[@3] and the combination of aureomycin and streptomycin in 67 cases of human *L. icterohemorrhagiae* and *L. bataviae* infections. Twelve additional patients that received no antibiotics served as controls. In this study, over 60% of the patients were acutely ill and 44% had clinical jaundice when treatment was instituted. These workers concluded that none of the antibiotics employed was particularly effective.

Reinhard[10] stated that, "At present there is no irrefutable evidence for the efficacy of any medicament in the treatment of bovine leptospirosis." Smadel[11] concluded that studies directed toward attempts to sterilize the tissues of swine, cattle, or horses chronically infected with leptospires are urgently needed. Recently Ringen *et al.*[12] reported on attempts to eliminate the carrier condition in cattle infected with *L. pomona* by dihydrostreptomycin and terramycin therapy. Their findings suggest that dihydrostreptomycin given intramuscularly at a level of 5 mg. per lb. of body weight every twelve hours for three days eliminated the

†From the Department of Veterinary Pathology and Hygiene, College of Veterinary Medicine, and the Agricultural Experiment Station, University of Illinois.

This investigation was supported in part by a grant from the University of Illinois Research Board.

The cooperation of Dr. F. E. Connor, Morris, Ill., Dr. W. E. Shumaker, Villa Ridge, Ill. and Dr. M. E. Mansfield, Simpson, Ill. for administering the antibiotics and collecting the blood samples is gratefully acknowledged.

The antibiotics were furnished as follows: penicillin, streptomycin, and terramycin by Chas. Pfizer and Co., Inc., Brooklyn, N. Y.; aureomycin by Lederle Laboratories Division, American Cyanamid Company, New York, N. Y.; and penicillin and bacitracin by Commercial Solvents Corporation, Terre Haute, Indiana.

@[1]Lederle Laboratories Division, Pearl River, N.Y.
@[2]Chas. Pfizer & Co., Brooklyn, N. Y.
@[3]Parke, Davis Co., Detroit, Mich.

UNIVERSITY OF MICHIGAN LIBRARIES

carrier state in four yearling heifers. Terramycin and a combination of terramycin and dihydrostreptomycin did not eliminate leptospiruria in three- to eight-month-old calves.

Materials and Methods

Herd A. This herd was comprised of approximately 300 purebred Hereford cattle kept under semirange conditions. Some Holstein cows used as nurse cows were maintained on the premises also. Three months prior to the experimental treatment described herein, the herd suffered from a leptospirosis abortion storm. At that time, acute cases were observed and several deaths occurred. A leptospirosis blood test survey made four weeks after the initial attack revealed 60 (71%) of 84 females tested as positive on the agglutination-lysis test. Nine weeks later, at the time of treatment, 34 (97%) of 35 cows selected for the experiment were found positive. The 35 cows ranged in age from two to seven years. They were divided into five lots according to their leptospiral titers. Each lot contained cows with low titers as well as some high titers.

Animals in lot I received penicillin at the rate of 7,000 units per lb. body weight, per day, for two weeks, intramuscularly. Fortified pronapen® for aqueous injection containing per ml: Penicillin G procaine, crystalline, 300,000 units, buffered penicillin G, potassium, crystalline, 100,000 units, and diamine penicillin 200,000 units was used.

The cows in lot II received a combination of terramycin and streptomycin. Crystalline terramycin hydrochloride was administered intramuscularly at the rate of 2 mg. per lb. body weight every other day for two weeks. Simultaneously, a total of 5 gm. of dihydrostreptomycin sulfate, crystalline, solution, was administered intramuscularly every other day for two weeks.

Lot III animals received a combination of penicillin and bacitracin. A dose of 6,000,000 units of 1-ephenamine penicillin G in aqueous suspension was administered intramuscularly, every other day for two weeks. Simultaneously, a dose of 25,000 units of bacitracin, systemic, for intramuscular use only, was administered intramuscularly, every other day for two weeks.

Animals in lot IV and lot V served as controls for the experiment and received no treatment.

The animals in each lot were blood tested with the leptospirosis agglutination-lysis test at nine weeks before treatment, at the time of treatment and at 2, 8, 14 and 30 weeks after treatment.

Herd B. This herd consisted of approximately 80 grade Holstein animals. About 30 were maintained as milk cows under average dairy farm conditions. Over a three-month period nearly all of the milking cows exhibited one or more symptoms characteristic of leptospirosis. Fever, abnormal milk, reduction in milk flow, abortion, and retained placenta were observed. Leptospirosis blood tests conducted on the milking cows five months after the first clinical case revealed every cow positive. Approximately seven months after the initial case, experimental antibiotic therapy was carried out. Clinical cases of leptospirosis had subsided, but the serological test revealed all cows as positive reactors and probably chronically infected. The milking herd was divided into three equal groups (lots) according to leptospiral titer. Each lot contained cows with low titers as well as some high titers.

The cows in lot I received streptomycin at the rate of 1 gm. per 100 lb. body weight, daily, for four days, intramuscularly. Dihydrostreptomycin sulfate, crystalline, solution was used.

Lot II animals received aureomycin. The dosage was 0.5 gm. per 100 lb. body weight, for four days, given intravenously. Aureomycin hydrochloride, crystalline, intravenous, was used.

TABLE 1. Experimental Leptospirosis Therapy—Herd A Blood Serum Agglutination—Lysis Titers (Summary)

Lot No.	No. An.	Treatment	Weeks Pretreat. 9	0	Weeks Post-treat. 2	8	14	30
I	7	Penicillin	1:3186	1:4857	1:214	1:214	1:87	1:55
II	7	Terramycin and Streptomycin	1:4600	1:7300	1:3160	1:1630	1:630.	1:40
III	7	Penicillin and Bacitracin	1:5886	1:6001	1:1643	1:1759	1:1750	1:70
IV	7	None	1:5886	1:6143	1:4729	1:1630	1:1617	1:55
V	7	None	None	1:1459	1:614	1:9	1:10	1:4

The cows in lot III were untreated and served as controls.

The animals in each lot were blood tested with the leptospirosis agglutination-lysis test at five and one weeks before treatment and at 3, 7, 11 and 23 weeks after treatment.

Leptospirosis Blood Test. The agglutination-lysis test,[18] using viable *L. pomona* ($NY-B_2$) organisms as the antigen, was the serological test employed throughout the study.

Results

Herd A. The seven cows that received penicillin in lot I had leptospiral titer averages of 1:3186 and 1:4857 in two separate pretreatment tests made at nine week intervals. Two weeks post-treatment the average titer was 1:214. During the remainder of the observation period the titers declined. At 30 weeks post-treatment the titer average was 1:55. See table 1. One cow with pretreatment titers of 1:100 and 1:1000 became negative.

The seven cows in lot II that received a combination of terramycin and streptomycin had titer averages of 1:4600 and 1:7300 in two pretreatment tests. Post-treatment titers declined so that 30 weeks after treatment the average titer was 1:40. See table 1. None of the cows of this group became completely negative during the post-treatment observation period.

In lot III, the seven cows that received a combination of penicillin and bacitracin had titer averages of 1:5886 and 1:6001 in two pretreatment tests. Thirty weeks after treatment the average titer was 1:70. See table 1. None of the cows in this group became completely negative during the post-treatment observation period.

Seven cows in lot IV were untreated. The titer averages during the pretreatment observation period were 1:5886 and 1:6143. During the post-treatment observation period the titers declined so that at 30 weeks the average titer was 1:55. See table 1. None of the cows in this group became completely negative during the post-treatment observation period.

Lot V contained seven cows that were not treated. On the first blood test made during pretreatment observation period all were negative. On the second test the average titer was 1:459. During the time corresponding with the post-treatment observation the average titer declined so that at 30 weeks it was 1:4. See table 1. Three cows from this untreated group returned to the negative status during the post-treatment observation period.

Herd B. The ten cows in lot I that received streptomycin had leptospiral titer averages of 1:2890 and 1:3250 in two pretreatment tests made at four-week intervals. The three-week post-treatment average titer was 1:235; however, the decline was only temporary as the average titer was 1:6220 at 23 weeks post-treatment. See table 2. None of the cows in this group became negative during the post-treatment observation period.

In lot II, the ten cows that received aureomycin, had pretreatment average titers of 1:4026 and 1:3250. The three-weeks post-treatment average titer was 1:442; however, the decline was only temporary as the average titer at 23 weeks post-treatment was 1:6400. See table 2. None of the cows in this group became negative during the post-treatment observation period.

Ten cows in lot III were untreated. The average titers during the pretreatment period were 1:1885 and 1:3250. There was an increase in the titer averages during the time corresponding with the post-treatment period so that at 23 weeks it was 1:9001. See table 2. None of the cows in this group became completely negative during the post-treatment period.

In both herds A and B, the courses of antibiotic therapy were well tolerated. No untoward reactions were noted.

Discussion

The serological results presented indicate that massive doses of the various antibiotics or combinations of antibiotics under the conditions of these trials did not materially alter the natural course of *L. pomona* infection in cattle. Leptospirosis agglutination-lysis tests

TABLE 2. Experimental Leptospirosis Therapy—Herd B Blood Serum Agglutination—Lysis Titers (Summary)

Lot No.	No. An.	Treatment	Weeks Pretreat. 5	1	3	Weeks Post-treat. 7	11	23
I	10	Streptomycin	1:2890	1:3250	1:235	1:5140	1:5221	1:6220
II	10	Aureomycin	1:4026	1:3250	1:442	1:4790	1:5387	1:6400
III	10	None	1:1885	1:3250	1:3232	1:4501	1:6400	1:9001

UNIVERSITY OF MICHIGAN LIBRARIES

conducted two and three weeks after treatment began, revealed that the antibiotic therapy apparently reduced the antibody titers; however, the reduction was not lasting in all cases. In herd A, experimental penicillin therapy aided in reducing the pretreatment titer average from 1:4857 to 1:214 within two weeks after treatment. In comparison, the serologically positive untreated control group had a titer average of 1:6143 during the pretreatment period and two weeks later it was 1:4729. The end results were the same in these two groups because 30 weeks posttreatment the titer average was 1:55 in both the penicillin treated group and in the untreated control group.

In herd B, experimental streptomycin and aureomycin therapy was followed by a decline in leptospiral average titers for a short period. However, in both groups the high titers returned so that some seven weeks after treatment the titer averages were slightly higher in the treated groups than in the untreated control group.

The reason for the decline in the titers shortly after treatment was not ascertained; however, it is recognized that this favorable trend might have continued had therapy been prolonged.

Neither bacteriological examinations nor animal inoculation tests were conducted to determine whether the cows were urinary shedders of *L. pomona*. Agglutination-lysis tests alone were used to evaluate the effect of antibiotic therapy. It was felt that if a drug promptly inhibited the multiplication of the causative organism and contributed to its disappearance from the body tissues, the detectable antibody level for the specific infecting agent would decline or disappear. Theoretically, the antibodies should disappear from the blood stream within a few weeks after the destruction of the active infection in the body. With the possible exception of one animal in herd A, lot I, which became negative, this apparently did not occur in the treated animals under observation.

It is apparent that the results reported herein as based on the average titer in the agglutination-lysis test follow the pattern of results as reported by most of the investigators who treated chronic cases of leptospirosis in man and in laboratory animals. Further research efforts should be continued in an attempt to find a satisfactory therapeutic agent.

Summary

Forty-one adult cows, in two herds, chronically infected with *Leptospira pomona* as judged by positive reactions on the agglutination-lysis test were treated with massive doses of antibiotics. Twenty-four additional cows in these herds were untreated and served as controls. Penicillin, streptomycin, aureomycin and combinations of terramycin and streptomycin, and penicillin and bacitracin were employed. The serological results described herein suggest that none of the antibiotics in the doses employed materially altered the natural course of the infection.

REFERENCES

1. Gsell, O., Leptospirosen, Bern, Medizinischer Verlag Hans Huber, 1952 (cited from Smadel, J. E., 1952).

2. Alston, J. M., and Broom, J. C., The Action of Penicillin on Leptospira and on Leptospiral Infections in Guinea Pigs. *Brit. Med. Jour.*, 2:718, 1944.

3. Chang, S. L., Studies on *Leptospira icterohaemorrhagiae*. II. A Critical Study of The Effect of Penicillin on *Leptospira icterohaemorrhagiae in vitro* and in Leptospirosis in Guinea Pigs. *Jour. Clin. Investig.*, 25:752, 1946.

4. Schlipköter, H. W., Ein Beitrag Zur Therapie der Leptospirosen. *Munch. Med. Wschr.*, 93:2300, 1951.

5. Heilman, F. R., Streptomycin in the Treatment of Experimental Relapsing Fever and Leptospirosis Icterohemmorrhagiae (Weil's Disease). *Proc. Mayo Clinic*, 20:169, 1945.

6. Heilman, F. R., Aureomycin in The Treatment of Experimental Relapsing Fever and Leptospirosis Icterohemorrhagiae (Weil's Disease). *Proc. Mayo Clinic*, 23:569, 1948.

7. Brunner, K. T., and Meyer, K. F., Streptomycin in The Treatment of Leptospira Carriers. Experiments with Hamsters and Dogs. *Proc. Soc. Exp. Biol. Med.*, 70:450, 1949.

8. Brunner, K. T., and Meyer, K. F., Effect of Aureomycin on *Leptospira canicola* and *Leptospira icterohemorrhagiae in vitro* and Experimental Carrier Studies. *Am. Jour. Vet. Res.*, 11:89, 1950.

9. Hall, H. E., Hightower, J. A., Rivera, R. D., Byrne, R. J., Smadel, J. E., and Woodward, T. E., Evaluation of Antibiotic Therapy in Human Leptospirosis. *Ann. of Int. Med.*, 35:981, 1951.

10. Reinhard, K. R., Newer Knowledge of Leptospirosis in the United States. *Exp. Parasitol.*, 2:87, 1953.

11. Smadel, J. E., The Therapy of Leptospirosis. Walter Reed Army Medical Center, Washington, D. C., Medical Sc. Pub. No. 1:202-211, 1952.

12. Ringen, L. M., Bracken, F. K., Kenzy, S. G., and Gillespie, R. W. H., Studies on Bovine Leptospirosis. I. Some Effects of Dihydrostreptomycin and Terramycin on the Carrier Condition in Bovine Leptospirosis. *Jour. Am. Vet. Med. Assn.*, 126:272, 1955.

13. Bryan, H. S., Studies on Leptospirosis in Domestic Animals III. Incidence of Leptospirosis in Cattle and Swine in Illinois. *Jour. Am. Vet. Med. Assn.*, 124:423, 1954.

▼ ▼ ▼

The use of udder steam bags has proved useful in my practice for the treatment of acute mastitis. Continuous wet applications, cold or hot as indicated, assist in relief of local congestion.—*Roy W. Westcott, D.V.M.*

Environmental Anthrax In North Carolina

MARTIN P. HINES,* D.V.M., M.P.H., Raleigh, North Carolina

ANTHRAX is an acute, infectious disease of animals which may be transmitted to man. It has world-wide distribution and is constantly a problem to the livestock industry in many countries. Cattle, sheep, and goats are most commonly infected. The disease has been endemic in many areas in the United States for years. In 1951 and 1952 there was great anxiety among livestock officials because of widespread outbreaks of anthrax among swine in midwestern states. The source of the swine infection was proved to be contaminated raw bone meal which was used in the feed rations as a mineral supplement.

Man is not as susceptible to anthrax as most domestic animals; however, anthrax does constitute a definite public health hazard in the United States. Human anthrax may be classified into two groups, industrial and agricultural. Industrial anthrax is acquired from contact with infected animal materials such as hair, hides, wool, and goat skins which are processed into various products. Most human cases result from contact with foreign, imported animal materials named above, rather than from domestic animal materials. Many of the countries which ship these materials to the United States have a high incidence of anthrax in their cattle, sheep, and goats. During the last decade, 82% of the industrial anthrax cases in the United States occurred among workers in those industries processing animal hair or wool, or both[1]. Agricultural anthrax usually is acquired by contact with infected animals while skinning, rendering, or performing an autopsy. Veterinarians, farmers, and rendering plant workers are the usual victims.

The cultural and morphological characteristics of the etiological agent of anthrax are described in textbooks of bacteriology. A few characteristics of this organism should be stressed, however, at this time. The organism has a high degree of virulence, and multiplies rapidly when it invades living animal tissues, producing a septicemia. In the presence of oxygen, the organisms form spores which, because of their resistance to chemical and physical killing agents, are a potential source of infection for both man and animals for long periods. Once the spore of *Bacillus anthracis* contaminates the soil, it may remain infectious for livestock for many years.

The purpose of this article is to present some facts and observations about an investigation of industrial anthrax in North Carolina. It is hoped that this report of action taken by health and agriculture officials in North Carolina will be helpful to others.

Report of Infection

Anthrax is not enzootic in North Carolina. There have been a few, small outbreaks among animals and a few human cases from contact with animals cases in the past, but none in recent years. Fear of anthrax in North Carolina, however, has not lessened over the years because of a severe outbreak which occurred in 1931 on a large dairy farm in Guilford County[2]. This disaster caused one veterinarian to contract a near-fatal case, and forced a large dairy farm to cease its operations. In addition, a lengthy legal case followed, involving a large city and its sewage disposal system, which was suspected to have contaminated the pastures of the dairy farm.

On March 23, 1953, Dr. Clem Ham, Union County Health Officer, reported to the North Carolina State Board of Health a human case of anthrax in a textile mill worker. Investigation by the writer on March 25 revealed the following facts: A subsidiary of a large textile mill in Philadelphia had moved to North Carolina in December 1952. A product called "hair canvas" was processed in this mill. Hair canvas is a fabric woven from goat hair which is blended with wool, rayon, and cotton and is used in the lining of men's and women's suits. The goat hair was imported from China, India, Pakistan, Iran and other Far Eastern countries. Investigation revealed the operations carried out in this plant were similar to those used in the cotton textile industry. Many weaving and spinning looms operated in this plant created a tremendous amount of dust, and there was a great amount of lint and hair suspended from overhead beams and on free

*Chief, Veterinary Public Health Section, N. C. State Board of Health.

UNIVERSITY OF MICHIGAN LIBRARIES

parts of the machinery. (It is estimated that approximately 8% of the hair is lost from the yarn during processing.) There were no exhaust fans in operation and absolutely none of the recommended safeguards for the protection of employees against contracting anthrax. Plant management had failed to notify the county health officer, prior to the human case, that such an industrial health hazard existed in this plant, and the State Board of Health was not consulted before the plant moved to the state. The raw goat hair used by this plant was imported through the port of Philadelphia and reshipped to North Carolina by truck.

The patient, a female, age 36, was working on a roving machine (the second step of operation after the hair is received in this plant) at the time she became ill. Because she was not aware of the dangers involved in this work, she failed to report her illness until a lesion on her forearm had progressed to the point where she was hospitalized in a serious condition for three weeks. Thanks to penicillin, she recovered completely. It should be mentioned, however, that there was much fear and apprehension on the part of other employees regarding this patient's illness. Further investigation revealed that all employees in this plant wore street clothes while working, and this practice could have established an enzootic focus of infection on farms through employees wearing contaminated clothes at home, since a majority of the employees lived on farms. Dirt, floor sweepings and trash were burned in an open trash pile, creating another public hazard. Plant sewage was emptied into a system with only primary treatment. The effluent was discharged into various streams and rivers flowing through rich livestock pasture land. The management at this time was cooperative, but insisted that human anthrax was, "nothing worse than a mere cold". Because of the lack of any precautions for the prevention of this disease in or around the plant, and because this plant was located in a rich livestock area of North Carolina where anthrax does not occur, it was felt that a great potential hazard existed both from the standpoint of public health and agriculture.

On March 26 the county health officer and the public health veterinarian gave the plant manager several suggestions which were related to the improvement of plant environment. The management also was informed that the North Carolina State Board of Health would consider suitable regulations for the operation of industrial plants where anthrax is an industrial health hazard. At this time the plant manager stated that several other plants in the New England and Philadelphia areas planned to move south because of the availability of labor and other advantages. It was stated that one of these plants was presently operating in South Carolina.

The State Board of Health requested assistance from the U. S. Public Health Service, and on April 8, Doctors John H. Scruggs and Sheldon C. Kravitz of the Communicable Disease Center arrived in response to this request. A thorough investigation was made and samples of goat hair and other materials were collected. Dr. Kravitz reported on April 17 that *B. anthracis* had been isolated from two of the samples collected. The offices of the Governor and the Commissioner of Agriculture were informed immediately of this report. On April 21 a further investigation was made, including the collection of air samples, in an attempt to isolate anthrax spores. Dr. Morris Gordon of the Airborne Pathogens Studies Section, Communicable Disease Center, assisted in this investigation and reported on April 27 that several of these samples, including air samples, were positive for anthrax. Details of the sampling procedures and results of the laboratory examination are to be published by Gordon *et al.*

On April 23 a call was made to Dr. B. T. Simms, Chief, Bureau of Animal Industry, U. S. Department of Agriculture, Washington, D. C. The problem was discussed briefly and Doctor Simms was asked what the Bureau of Animal Industry could do to prevent contaminated goat hair from being shipped into North Carolina. The fact was stressed that this was a rich livestock area and it seemed that the state should have some protection from interstate shipments of this material. It was also stated that the State Board of Health felt that the United States should require at least the same type of treatment for imported animal hair which has proved effective in England or should develop, through research, a better, more efficient method. It was agreed that a conference should be held to discuss this problem further with officials of health and agriculture attending. It was decided to hold this meeting in Washington, D. C. on May 8.

On April 24 the latest developments were discussed with the North Carolina Commissioner of Agriculture, Mr. L. Y. Ballentine, and the State Veterinarian, Dr. H. J. Rollins. All doubted the wisdom of waiting for any federal action to be taken on May 8. The possibility of prohibiting the importation of goat hair into North Carolina was discussed and existing

Cont. on p. 371

The Use Of Adrenocorticotropic Hormone (ACTH) In Small Animals

D. F. M. BUNCE II,* Ph.D., Chicago, Illinois

THE increasing number of human diseases responding favorably following the use of ACTH led to its trial in both large and small animals. While much has been reported on the value of the hormone for the control of ketosis and respiratory conditions, principally affecting large animals, only sporadic accounts have appeared regarding its use in dogs and cats.

Description of ACTH

ACTH is adrenocorticotropic hormone, one of several secreted by the anterior pituitary gland (fig. 1), and functions as the true physiologic stimulus to the adrenal cortex. It causes production and secretion of the entire spectrum of cortical hormones at an increased rate. No other substance to date has been demonstrated to be capable of stimulating the adrenal cortex directly with subsequent release of these hormones into the blood stream.

While at least 28 different steroids have been isolated from adrenal cortical tissue, only six have been shown to have biological activity. Three general types have been differentiated:

1. Compound F-like steroids or glucocorticoids, commonly are referred to as sugar or energy hormones because they mobilize energy sources (glucose, fat, protein) and restore energy in the form of glycogen. In addition, these steroids have some effect on electrolytes and water retention, resulting in improved hydration, as well as possessing some androgenic properties.

2. 11-desoxycorticosterone-like steroids or mineralocorticoids, are referred to as salt-regulating hormones because they play an important role in the retention of sodium and chloride and the excretion of potassium.

3. Androgen-like steroids, are referred to as the protein hormones because they stimulate protein synthesis, prevent breakdown and antagonize the catabolic effects of compound F-like steroids such as cortisone. Adrenosterone-like corticoids may include a positive nitrogen balance and increase body protein in contrast to compound F-like hormones which may produce a negative nitrogen balance and a wasting or decrease of the protein mass. The ratio of magnitude of secretion of these two groups of hormones (adrenosterone-like and compound F-like corticoids) by the adrenal cortex may be a major determining factor in the over-all effect of adrenal cortical stimulation by ACTH on the total body proteins.

The therapeutic efficacy and clinical safety of ACTH derive from the fact that it stimulates secretion of all three types of cortical hormones, all of which are of particular importance in the face of stress situations.

The use of ACTH is not disease-specific as are the antibiotics, nor is treatment aimed at any particular organ as in the case with digitalis. Rather, ACTH, by stimulation of the whole adrenal cortex and secretion of all its

*Research Department, The Armour Laboratories.

UNIVERSITY OF MICHIGAN LIBRARIES

hormones, aims at the basic constituents of the body—the cells and the tissues.

Following a single, severe, acute injury to a tissue, certain physiologic and metabolic changes occur as a result of damage to the cellular integrity. The cell membrane normally keeps potassium (K) and phosphorus (P) mostly within the cell, while sodium (Na) and chlorine (Cl) are largely excluded. As a result of injury, this equilibrium is upset with potassium and phosphorus being lost from the cell and Na and Cl replacing these ions. The spatially arranged enzyme systems of the cell may become disorganized, and the orderly regeneration of cell protein may be altered with loss of nitrogen and further loss of K and P from the cell. Further, the enzyme inhibitors which normally restrain tissue metabolism, may be altered and the cellular consumption of oxygen may increase at the expense of local, immediately available carbohydrate reserves.

The immediate reaction of the body to injury or stress is secretion of large quantities of epinephrine (fig. 2). Among the physiological changes produced by this sympathomimetic substance are increased alertness, pupillary dilation, peripheral vasoconstriction, increased blood pressure and mobilization of liver glycogen to provide glucose as a source of ready energy for muscle and brain. Augmented amounts of ACTH also are produced by the anterior pituitary in stress situations through the indirect action of adrenalin on the hypothalamopituitary system. (See fig. 3). These immediate changes are made at the expense of the carbohydrate reserves, and result in considerable loss of water and electrolytes as body temperature increases through stress activity.

That an auto-regulatory mechanism exists is demonstrated by the fact that an increase in the amount of circulating adrenal cortical hormones may suppress secretion of ACTH by the pituitary; conversely, a decrease in the hormone concentration stimulates enhanced ACTH output.

This adaptation mechanism may be circumvented by the administration of exogenous ACTH. A high degree of adrenal cortical secretion may be achieved in this way, and unphysiological levels of cortical hormones produced by by-passing the natural control arrangement (fig. 4). Exogenous ACTH does not appear to differ in its effect on the adrenal cortex from the endogenous hormone in the presence of a responsive adrenal cortex.

Effects of Adrenal Cortical Stimulation

Inflammation. Adrenal cortical stimulation by administration of ACTH has a marked effect on the pattern of tissue response to toxic agents. The inflammatory reaction is diminished in intensity, perivascular exudation is decreased, and pus formation minimized, even though there may be a marked leucocytosis (fig. 5). In allergic reactions, ACTH reduces or inhibits local swelling, itching, and vesicle formation.

Pain. Pain is a phenomenon common to many diseases characterized by cellular damage. ACTH acts to alleviate or inhibit this

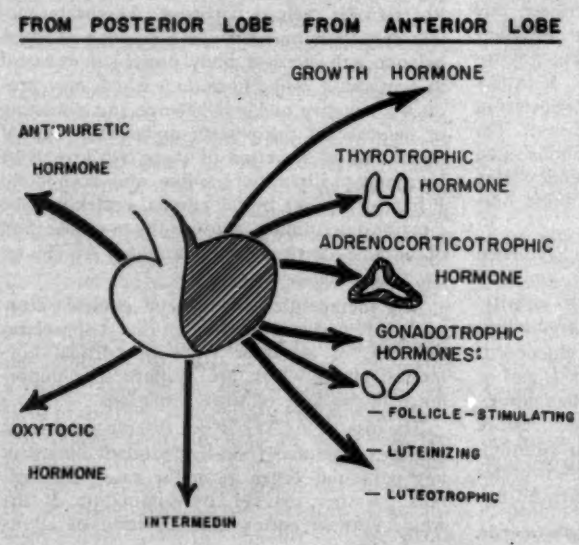


Fig. 1. Pituitary hormones.

symptom even in the presence of the intense pain associated with neuralgia or burns. This effect, mediated through adrenal cortical stimulation, probably represents a protective action on tissues at the cellular level. Disappearance of pain is an index of beginning improvement where it is a symptom of the disease being treated; however, when administered for pain ACTH must be discontinued as soon as feasible, since adrenal cortical hormones in excess tend to mask this symptom.

Fatigue. Fatigue is a clinical symptom associated with a great many disorders of both large and small animals. It may be due to a failure to remove certain by-products of metabolism, exhaustion of energy-yielding substances, breakdown of normal neuromuscular function, or other respiratory or circulatory phenomena. In fatigue resulting from chorea, stress-producing situations, or in the chronically ill dog with a rheumatoid arthritis associated with asthenia, ACTH acts to relieve fatigue rapidly, hasten disposal of toxic waste products, and impart a sense of well-being. It is, in addition, generally agreed that the hormone tends to bring about a decided early improvement in appetite, occasionally even causing an increased dietary intake.

Temperature. It has been well established that adrenal cortical stimulation by exogenous ACTH tends to effect an early return to normal temperature in disease syndromes associated with fever. It further appears that therapeutic doses prevent production of temperature rise, even in such a severe pathological state as generalized peritonitis.

Briefly summarized, ACTH acts to effect a marked sense of well-being in an animal, which can not be accounted for entirely by the relief of pain and discomfort. Because administration of the hormone tends to effect an early return to normal health in a wide range of conditions, it is evident that adrenal cortical hormones exert a profound impact on the entire bodily economy, probably by imparting a protective, stabilizing influence at the cellular level.

Present Investigation

Well over 1,000 cases reporting the use of ACTH in small animals have been reviewed in the past two years. Investigators from many parts of the world have provided the results of studies on the effect of the drug in almost every condition common to cats and dogs. A pattern has slowly evolved which permits, within its boundaries, prediction of a fair degree of therapeutic success in treatment of certain

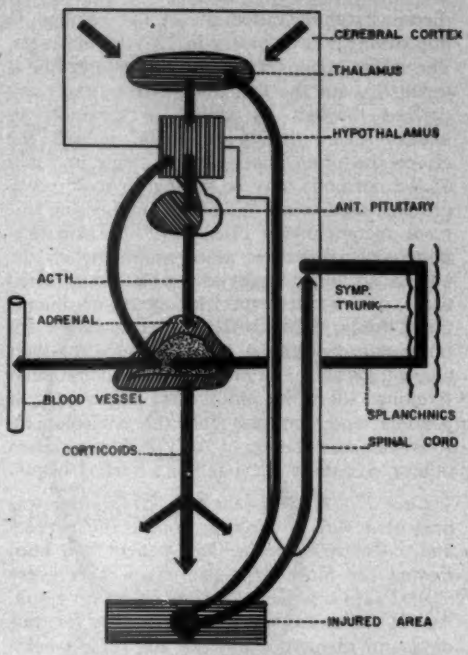


Fig. 2. Pathways involved in increased secretion of ACTH following trauma.

disease syndromes. A series of representative case reports are described which will serve to point out the types of disorders found amenable to adrenomone®. The survey necessarily is confined to describing the treatment results of disease states most commonly observed by the small animal practitioner; limitations of space prevent inclusion of the findings in the ACTH therapy of some of the more unusual or infrequently occurring conditions.

It should be emphasized that the following reports are confined to those cases in which ACTH effected varying degrees of improvement. Negative results are not included in the series. One must be careful in evaluating these histories, therefore, not to be led down the pathway of the false premise that ACTH is a "wonder drug". Such thinking is not realistic; those who have used the hormone agree that when it is administered thoughtfully and where indicated, the results are generally good and often dramatic, but like most other therapeutic agents, it must not be regarded as a "cure-all".

Dermatoses

In over 300 dogs and cats suffering nonspecific dermatoses resistant to other forms of

®Armour Veterinary Laboratories' trade name for purified adrenocorticotropic hormone (ACTH) in 16% gelatin.

UNIVERSITY OF MICHIGAN LIBRARIES

therapy, administration of ACTH resulted in improvement or recovery in 76% of the cases. The direct action of the drug in skin repair is unknown, but the beneficial effects likely are derived through its ability to diminish or abolish severe itching and pain. Indeed, the effects are often impressive. A single injection of the hormone may be all that is required to produce relief from the almost intolerable torment accompanying diseases of the skin. Remission usually takes place rapidly when the animal no longer scratches or bites at affected areas. When such specific agents as mange mites, fungi, ticks, or fleas are responsible for onset of a dermatosis, drugs designed for their control should be administered concomitantly. Exciting allergens should be discovered, if possible, and removed from the environment. It is well to discontinue ACTH therapy when itching or pain is alleviated and healing begun.

Case 1. A four-year-old, 20-lb. dog was presented with a chronic, nonspecific eczema and extensive alopecia. This patient had been treated for more than two years with every topical skin treatment available with no result. ACTH (20 units) was then given daily for four days and then once a week for three weeks. At the end of the treatment period the eczema had disappeared completely and new hair almost completely grown in.

Case 2. A two-and-one-half-year-old, 70-lb. Pointer was treated for nonspecific dermatitis. The animal was scratching and biting continuously. This dog had been treated for the previous two months with numerous skin preparations and internal medication with no improvement. Euthanasia was advised. ACTH (80 units) was administered every other day for 16 days, and lanolin applied to the skin following each administration of hormone. An improvement was noted after two treatments. All scratching and biting ceased and by the 16th day complete recovery was evident. No recurrence during observation period of three months.

Case 3. A four-year-old, 47 lb. Pointer was presented with severe urticaria, edema of the head and ears and a suppurating lesion on the nose. The animal was presented within 30 minutes after observation of the urticaria by the owner. Antibiotics were given immediately along with proteolytic enzyme treatment for the nose lesion. This treatment was continued for 48 hours with no improvement in the allergic manifestations. The animal appeared to be in severe distress. On the third day, 60 units of ACTH were administered. Twenty-four hours later there was a definite improvement in the condition of the ears, the edema disappeared and the urticarial wheals which had been present all over the body had disappeared. After an additional 24 hours, 40 units of ACTH were injected and repeated again on the fifth day for a total of 140 units. There was ultimate, complete recovery.

Case 4. A seven-year-old, 55-lb. mixed breed was presented with a chronic deep dermatitis, moderate nephritis, secondary fungus infection and acute suppurative otitis externa. The animal was hospitalized for six days for local treatment of the otitis and skin condition. No improvement was effected and on the seventh day 60 units ACTH were administered. There was a definite improvement on the following day; an additional 60 units ACTH were then administered and the animal discharged.

Case 5. A five-year-old, 20-lb. Cocker Spaniel had been treated by a number of veterinarians for a marked alopecia and severe dermatitis with no apparent result. The skin was greasy and the hair absent from about 50% of the body surface. Dip treatments were given with some improvement. ACTH (20 units) was finally administered daily for three days. The skin dried out and the hair began to reappear. Complete recovery was not obtained in this case, but the animal was considerably improved.

Case 6. A two-year-old, 60-lb. Collie was presented with a moist eczema extending from the tail to the middle back. The dog was clipped and treated with local ointments with little improvement. The animal was discharged, but returned two weeks later with a dry eczema and was scratching continuously. ACTH (60 units) was administered every day for five days with prompt relief of the itching. Complete recovery was effected by the end of the second week.

Case 7. A one-year-old, smooth-haired Fox Terrier was presented with hot spots around the tail head. Numerous drugs were administered which gave no relief of symptom. This dog continued to rub on the furniture and the floor and bite at affected areas continually. ACTH was administered on the first, second, fourth, sixth, and eighth days. By the second day irritation had disappeared, and at the end of the treatment, hair had begun to cover bald areas and the dog appeared to be completely recovered.

Case 8. A 60-lb. male Collie with eczema was treated with ACTH every third day for three treatments. There was a marked improvement following the second injection; however,

the dog began to scratch again. The third injection again resulted in relief but three weeks later symptoms reappeared. This case was of a chronic nonspecific nature and it since has been found necessary to maintain the animal on 30 units ACTH given once every three weeks.

Case 9. A 48-lb., eight-month-old, male Boxer was presented with a generalized case of hives. The temperature was 103 F., and there were large, raised, edematous areas over the entire body. The dog appeared to be in acute distress. No previous treatment had been given though condition had existed for nearly 24 hours. ACTH (50 units) was administered and the dog was completely normal within three hours.

Ophthalmic Conditions

Adrenocorticotropic hormone, through adrenal cortical stimulation, is regarded as a primary drug in the treatment of many ocular disorders including allergic conditions. It is, of course, necessary to the basic management of the latter that removal of the allergen be accomplished, followed by the administration of ACTH for relief of symptoms. The hormone appears to be efficacious in treatment of acute conjunctivitis, iritis, uveitis, pigmentary keratitis, and corneal opacity. There are certain ophthalmic conditions with a tendency to recur; these cases require maintenance doses of ACTH at intervals to be determined by response in the particular animal.

Case 1. A five-year-old, 43-lb. female English Bulldog was presented with pigmentary keratitis. There was excessive vascularization of the sclera. The condition had been present when the animal was purchased by the owner four months previously. No other history was available. ACTH (50 units) was administered every other day for three treatments. By the end of the third injection, the vascularization was reduced greatly and most of the pigment had been absorbed.

Case 2. An eight-year-old, 25-lb. Cocker Spaniel was treated for a mild pigmentary keratitis. ACTH (30 units) was administered at 48-hour intervals for four doses. There was satisfactory response. Four months later the animal was returned with the same condition. Three more injections were given at 48-hour intervals and the pigment has shown no tendency to recur.

Case 3. A three-year-old, 20-lb. Fox Terrier was presented for clouding of the cornea. There was no previous history of illness. ACTH (30 units) was administered at 48-hour intervals for three injections. The clouding disappeared and the eyes have remained clear for about four months.

Emergency and Stress Conditions

Probably the most important of the effects which follow administration of ACTH is the rapidity with which it combats shock and relieves stress. In many instances, this means the difference between life and death to a patient; in other cases, the mitigation of toxic reaction

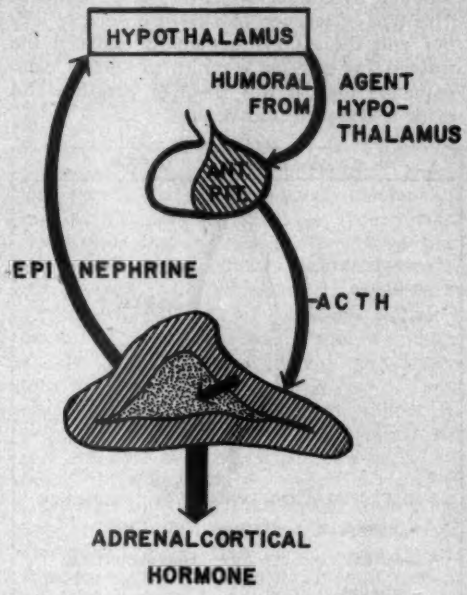


Fig. 3. Hypothalamic-pituitary-adrenocortical system.

to some drugs permits completion of specific therapy. Further, alleviation of pain and a feeling of well-being permit earlier medical or surgical management.

Relief of symptoms such as chronic cough, continual scratching or biting, or obvious pain, that are distressing to the animal and annoying to the owner, often may be observed following one or two injections of ACTH.

The following cases illustrate several situations where the drug has been of value:

Case 1. A four-year-old, 50-lb. Boxer was presented with four-plus filariasis and ascites. Hemoglobin 50%. The abdomen was so distended that it required paracentesis and drainage for 48 hours. Treatment consisted of a blood transfusion amounting to 10% of the calculated blood volume, diuretics and 40 units of ACTH daily for five days. At this time the animal was improved considerably and there

UNIVERSITY OF MICHIGAN LIBRARIES

was no additional fluid accumulation. Heart worm therapy was initiated and completed without undue incident. A check-up five months later revealed the animal had made a complete recovery.

Case 2. A one-year-old, eight-pound cat which was essentially normal on physical examination was found to have ascariasis. Ascaracidal treatment resulted in a severe toxic reaction. ACTH (10 units) was given and was followed by complete recovery in 15 minutes. This type of reaction in a cat is ordinarily serious and the ACTH apparently reduced the toxicity and effected a return to normal. Subsequently the cat was freed of parasites and made a complete recovery.

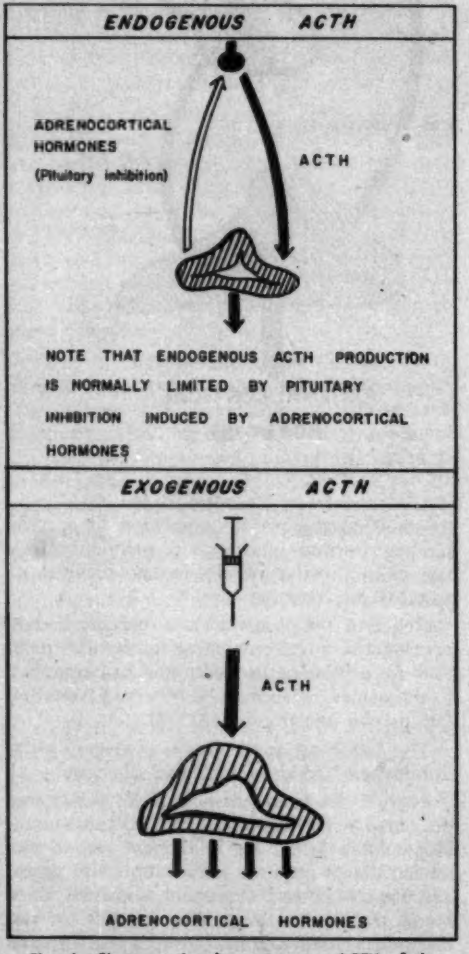


Fig. 4. Circumvention by exogenous ACTH of the mechanism normally protecting the adrenal cortex from excessive stimulation.

Case 3. An eight-year-old, 16-lb. Dachshund was presented with a temperature of 103.4 F. Eyes were dilated and the animal walked with a "bowed-up" appearance. Upon palpation, a distended bladder was found. Rectal examination revealed a greatly enlarged and acutely painful prostate. There was passive incontinence and the urine contained some spermatozoa. A history of recurrent prostatitis was obtained from the owner. Stilbestrol parenterally and orally had been used in the past, along with catheterization and prostatic massage. Some relief followed this treatment schedule. In the present instance, the animal was catheterized, the prostate massaged and 15 units ACTH administered daily for five days. At this time the prostate was reduced in size and no longer painful, and the dog maintained full sphincter control. The urine was negative for spermatazoa. Two months later, examination and history revealed there had been no recurrence of the condition.

Case 4. A four-year-old, 26-lb. Cocker Spaniel was presented with a temperature of 103 F., extremely rapid heart rate, injected sclerae, and the lungs and membranes edematous. The animal was prostrate when admitted. It had just been rescued from a kennel fire and a diagnosis of inhalation pneumonia with edema of the lungs was made. ACTH (40 units) and 200 cc. 10% dextrose and saline were administered immediately, and 40 units of the hormone injected on each of the following two days. The animal was discharged four days after admission to the hospital, and apparently had made a complete recovery. Six weeks later, follow-up revealed no further complication.

Case 5. An eight-month-old, four-pound cat was admitted to the hospital following an automobile accident. Physical examination revealed fracture of the mandible, crushing of the maxillary bones and apparently some pulmonary damage including hemorrhage. Penicillin 300,000 units and oxygen were administered immediately after examination. On the third day the animal was submitted to surgery and the jaw was wired. The cat was discharged two days later in generally good condition. Temperature during initial hospitalization ranged up to 104 F., and at discharge was normal. Appetite was good and elimination was normal. The cat was returned less than 24 hours after discharge—temperature 102.2 F., extremely depressed and a history that it had been very excited since leaving the hospital. Penicillin and streptomycin were administered along with 20 units ACTH. Twelve hours later the animal was improved greatly and had

a normal appetite and temperature. ACTH (20 units) was administered daily for the following three days. Two days after cessation of the ACTH therapy, the animal was discharged in good condition. The wire was removed from the jaw five days later, but a few secondarily infected areas had developed in the mouth as a result of the original injury. The temperature returned to 102.2 F. and penicillin and streptomycin were then given with a complete return to normal. The veterinarian treating this case noted an exceptionally gratifying improvement and stated that the animal was taken from a downhill course to a definitely uphill one within a matter of 12 hours.

Case 6. A nine-year-old, 18-lb. Boston Terrier was admitted with a tumor about the size of a goose egg in the left throat. The tumor was removed surgically under local anesthesia and 250 cc. 5% glucose in saline given intravenously. Twenty-four hours later there was severe swelling noted in the throat region which became increasingly worse during th next three days. On the fourth day the animal was obviously uncomfortable due to the accumulation of fluid. There was anorexia although the temperature remained normal throughout. ACTH (60 units) was administered and improvement noted in the face within 18 hours. A second dose of ACTH was given at the time and swelling continued to diminish. The animal was discharged as completely recovered two days later.

Case 7. A four-year-old, 26-lb. Cocker was presented almost completely paralyzed in the hind legs. Temperature was 102.2 F. History revealed the paraplegia had its onset eight days earlier and that the animal had been treated by another veterinarian for one week with no improvement. Physical examination revealed posterior paralysis and prostatic enlargement. A parasympathomimetic muscle stimulant was administered along with estrogen and B complex for three days with no improvement. ACTH therapy was initiated and continued for four days. On the fourth day the animal was able to walk. The ACTH was continued for four more days at which time the animal was discharged, walking comparatively well. A recheck in five weeks disclosed that the animal was walking normally and has since suffered no recurrence of paralysis.

Case 8. A six-year-old, 61 lb. Collie was presented with a history of marked weight loss over a two-month period. Examination revealed the presence of filaria, typical heartworm symptoms and ascites. Heartworm therapy was begun immediately, and on the eighth day a severe toxic reaction was manifested by a temperature of 103.4 F., stiffness, and lacrimation. The arsenical was withdrawn immediately, and on the following day the temperature was 104.6 F. B Complex, aspirin, antihistaminics and BAL were given without appreciably relieving reaction. The animal was stiff and sore and the temperature varied between 102.8 and 104 F. Appetite remained good. Six days after the onset of toxic symptoms, ACTH (60 units) was administered. Twenty-four hours later an improvement was apparent enough so that heartworm therapy was uneventfully continued.

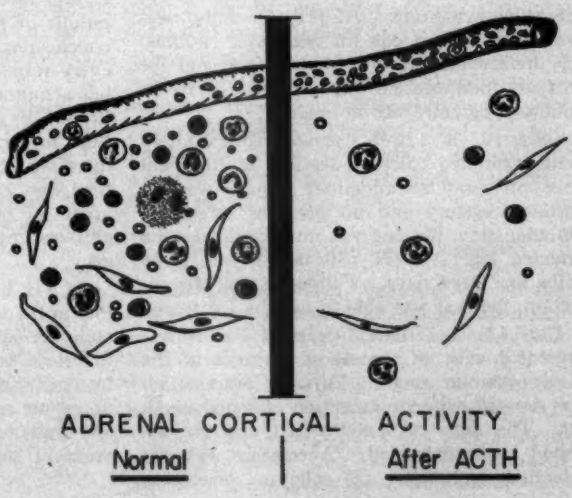


Fig. 5. Changes in the inflammatory reaction.

UNIVERSITY OF MICHIGAN LIBRARIES

Case 9. A 35 lb., four-year-old mixed breed dog was admitted to the hospital with a temperature of 102 F., slight incoordination in the hind legs and typical heartworm symptoms. Two plus filarial infestation was found on direct smear. The animal was listless and had no desire to eat. It was decided that the physical condition was not good enough to begin heartworm therapy. An enema was administered, and 60 units ACTH injected once a day for two days. Forty-eight hours later there was a remarkable improvement in the general condition of the animal, and heartworm therapy was instituted. No toxic reaction occurred and the animal completed schedule of treatments.

Case 10. An eight-year-old, 21-lb. Boston Terrier was presented with well developed rheumatoid arthritis. Reflexes were sluggish and the gait was stiff. There was no radiological evidence of herniated intervertebral disk. A history revealed that the animal had developed a stiff gait about a month earlier and was treated by other veterinarians with no apparent improvement. ACTH (40 units) was administered every 48 hours for a total of three doses. The animal was improved considerably after the second dose and the gait was normal following the third injection. The owner was contacted about two months later at which time he stated that the dog was much better.

Case 11. A three-year-old, 20-lb. Cocker Spaniel was presented with rheumatoid symptoms. There was considerable generalized pain and the animal whined whenever it moved any part of its body. Penicillin was administered daily for two days with no decrease in subjective symptoms. ACTH (20 units) was then given once a day for two days. Following the second injection, the whining and the stiffness disappeared. One week later the animal apparently was normal.

Case 12. A 120-lb., seven-year-old Great Dane exhibited calcium deposits in the right knee on *x*-ray examination. There was no pertinent history and no previous treatment. On admission, the dog was not able to use the affected leg. ACTH (80 units) was given daily for three days. Following the last injection, the dog was able to use the leg freely.

Case 13. A 26-lb., 11-year-old Terrier was presented with an abscess at the root of the third premolar tooth. Physical examination was normal with the exception of facial swelling. The dog was anesthetized and the affected tooth extracted. Anesthesia was not tolerated and signs of collapse developed. ACTH (30 units) was administered, after which the patient began to breathe normally and eventually made an uneventful recovery.

Case 14. A 15-month-old, 30-lb. mixed breed dog was presented at 2 a.m. following an automobile accident. He had been struck in the head and was comatose. Examination revealed epistaxis and blood in the anterior chamber of the left eye, which was considerably swollen. No fracture could be palpated. Temperature was 102.8 F. ACTH (50 units) was administered immediately (the veterinarian noted that he had to do something fast at that time of the morning). The following day the animal apparently was normal.

Case 15. A three-year-old, 18-lb. Fox Terrier was presented with tonsillar enlargement, bronchitis, and severe cough. A tonsillectomy was performed and the animal given antibiotics for ten days with no appreciable improvement in the cough. ACTH (20 units) was administered daily for four days, at which time the cough had disappeared and the animal apparently had made complete recovery.

Discussion

In evaluating any drug, results obtained following its use will be compared formally through a series of carefully compiled statistics, or perhaps unconsciously by mental note, against any therapeutic agent used previously in treatment of a similar condition. It is natural to become enthusiastic when a product manifests a dramatic, beneficial outcome following one or two applications, or conversely, to condemn it when it fails to achieve miraculous cures after an equal number of trials. The careful investigator will recognize the obvious pitfalls of hasty inference based on unproved conclusions. Rarely are two cases alike in every respect; the interaction of the effect of one symptom upon another varies from patient to patient, and even in the same patient from time to time. In pure clinical investigation, therefore, only the sheer weight of numbers, time and experience enables the examiner to arrive at more than tentative, accurate conclusions regarding drug application and efficacy.

ACTH has been shown to be a powerful tool in the veterinarian's armamentarium. Used alone or adjunctive to other therapy, it acts to effect both objective and subjective relief by restitution of normal physiological patterns of eating and sleeping, by remission of pain, and induction of a return to normalcy or a sense of well-being.

(*Continued on page* 366)

Intramuscular Use Of Neomycin In The Dog: A Case Report

LEWIS K. TODD,* D.V.M., and HOWARD L. WRIGHT,* D.V.M.,
Tacoma, Washington

REPORTS concerning application of neomycin therapy in veterinary medicine are being published with frequent regularity. The antibiotic is indicated in such varied conditions as bovine mastitis and intrauterine infections; enteric infections; eye, ear, and skin infections; abrasions and wounds; and for preoperative and postoperative preparation of the intestinal tract. In powder form, using a special base, neomycin is a versatile antibiotic dusting powder with many uses.

This report constitutes what is believed to be the first clinical data presented on use of intramuscular neomycin in treatment of canine diseases**.

Characterization of Neomycin

In 1949, as the result of a long series of investigations, a new antibiotic was isolated from a culture of *Streptomyces fradiae*. Since isolation, further purification, and general and chemical properties were similar to those of streptomycin; it was named "neomycin"—the new mycin.

Neomycin has primarily bactericidal action against Gram-positive, Gram-negative, and acid-fast organisms. Its antibacterial spectrum is broader than spectra for penicillin, streptomycin, or bacitracin. It is inactive against viruses, protozoa, and fungi.

Neomycin sulfate used in these studies was sterile powder mycifradin® sulfate. The product is stable indefinitely in the dry form. It is thermostable and unaffected by actions of bacteria or products of bacterial growth. Resistance to its bactericidal action has been clinically unrecognized.

Pharmacology

Solutions of mycifradin suitable for intramuscular injection may be prepared by adding 2 cc. or 2.5 cc. of sterile isotonic solution of sodium chloride for parenteral use, to the contents of a vial of sterile powder mycifradin sulfate, 0.5 gm. Resultant solutions contain 250 mg. per cc. or 200 mg. per cc. respectively. Prepared solutions should be refrigerated and used within 24 hours. Portions remaining after 24 hours should be discarded.

Following intramuscular injection in the dog, neomycin is readily absorbed into the general circulation, with production of measurable blood levels, and is distributed throughout the body. Demonstrable levels of the antibiotic may also appear in the plural and spinal fluids. It does not accumulate in the tissues, and is rapidly excreted by the kidney.

Intramuscular injections of neomycin at dosages of 6.5 and 25.5 mg./kg. every six hours for eight days have produced continuously demonstrable plasma levels in dogs, with no concurrent toxic symptoms or alterations in urine, blood chemistry, or hematology[1]. When administered in massive doses, 33 and 66 mg./kg./day, tubular degeneration of the kidney has been reported, with possible glomerular involvement. Dogs died after six to 19 days at the 66 mg. level. There was fatty degeneration of the liver in some cases[1].

Intramuscular use should be restricted to patients in hospitals with serious systemic infections resistant to other therapy but neomycin-susceptible. Impaired renal function, albuminuria, casts, and cellular elements are contraindications and toxic signs. Treatment should not exceed ten days.

Use In Demyelinating Encephalitis

Although neomycin possesses no antiviral properties, application was thought rational in serious cases where systemic secondary bacterial invasion had occurred. It was thus applied in cases evidencing symptoms referrable to demyelinating encephalitis of viral origin.

Nine affected dogs, all young, demonstrating similar symptoms, and all with elevated temperatures, were given mycifradin therapy and

*Lakewood Veterinary Hospital, Tacoma, Washington.

**The authors are indebted to Kenneth B. Haas, D.V.M., Department of Veterinary Medicine, The Upjohn Company, Kalamazoo, for supplying intramuscular neomycin for use in these studies, and for contributing credited material used in this article.

®The Upjohn Company, Kalamazoo, Mich.

specific and nonspecific supportive treatment. Dose of mycifradin in all cases was administered intramuscularly at the rate of 5 mg. per lb. of body weight. Treatment extended for two to ten days. Body temperatures in all cases returned to normal promptly (24 to 48 hrs.) after initial treatment. Only two of nine cases recovered completely and two others exhibited improvement only to worsen later. The general condition of five deteriorated progressively until euthanasia was performed. It must be emphasized that these were all *in extremis* when presented for treatment.

Use In Chorea

Mycifradin was also used in treating chorea as a sequel to canine distemper. Dosage administered was identical to that injected in demyelinating encephalitis cases, 5 mg. per lb., intramuscularly, daily.

Case 1. Five-month-old dog with early symptoms of chorea and a temperature of 103.5 F. was presented. Mycifradin was injected for five days, vitamin B complex, vitamin B_{12}, rutol, and pyridoxine were also administered. Rutol and the vitamin complex were continued for over a month.

The temperature of this animal returned to normal in 24 hours. There was no further progression of the chorea syndrome after the tenth day. Complete recovery is expected.

Case 2. Four-month-old dog with developed chorea and a temperature of 103.8 F. was presented. Mycifradin, vitamin B complex, and rutol were administered. Complete recovery appeared probable, but the owners requested euthanasia.

Use In Bacterial Infections

Mycifradin, while inactive against primary virus diseases, would be expected to be bactericidal in diverse bacterial invasions. The product was thus applied in a case of chronic cellulitis, and several cases of streptococcic septicemia, with excellent results.

Chronic Cellulitis. An animal with a badly swollen foot and a temperature of 105.4 F. was presented for examination and treatment. Diagnosis of cellulitis was made, and systemic penicillin therapy instituted. The animal's temperature returned to normal, and it was released.

In several days the dog was returned, with the original symptoms. Penicillin and sulfonamide therapy were initiated, and were ineffective in controlling the process. Oxytetracycline was also administered intramuscularly. There was temporary response, then exacerbation.

When the animal's temperature was 104 F., intramuscular mycifradin was administered. Temperature returned to normal within 24 hr.

Streptococcic Septicemia. Neomycin was employed in several cases of streptococcic septicemias, in which initial temperatures ranged from 104 to 106.5 F. Excellent results were demonstrated, all temperatures returning to normal in 12 to 14 hours.

Summary and Conclusions

Mycifradin sulfate was administered intramuscularly to cases of late (7) and early (2) demyelinating encephalitis; early (1) and late (1) chorea; chronic cellulitis (1), and several cases of streptococcic septicemia. A dosage schedule of 5 mg. per lb. daily was employed, with concurrent supportive treatment in all cases.

Although neomycin does not possess antiviral properties, temperature reduction in cases of demyelinating encephalitis and chorea, was effected. Action was probably through control of secondary bacterial invaders present. Early demyelinating encephalitis and early chorea appeared to benefit from therapy.

Bacterial cellulitis and several cases of streptococcic septicemia responded effectively to neomycin therapy, as expected in cases of primary bacterial infection.

Although the number of reported cases is limited, and definite results can not be established, mycifradin appears to cause no side effects. It appears to have a definite place in the veterinarians' antibiotic armamentarium.

TABLE 1. Neomycin Blood Levels After One Intramuscular Injection In Dogs†

Kg. wt.	Mg. neomycin/kg.	Mg. total dose	mcg. neomycin/ml. blood Hours ½	1	2	4	6	24	% urine excretion 72 hr.
17.5	14.3	250	.....	21.5	11.2	5.2	1.9	0	49
14.6	14.3	209	8.7	17.7	17.9	9.5	5.2	0	65
14.6	14.3	213	24.9	23.3	14.4	5.8	1.9	0	88

†Unpublished data from The Upjohn Company Research Laboratories, Kalamazoo, Mich.

(*References on page* 366)

Intrathoracic Anesthesia In Cats

MARK STERNFELS, D.V.M., Mount Vernon, New York

WHEN a human patient is suffering from an ailment which calls for surgical interference, laboratory technics are employed to aid in the diagnosis. Preoperative injections of dextrose and saline solutions are given to raise blood sugar levels for prevention of shock and dehydration.

The anesthetist is usually part of the surgical team. The surgeon selected is a specialist in anatomy for the parts involved, while a staff of assistants is selected to aid in the performance of his skills. Surgery is planned for a specified time and day, and the patient is kept without food for a definite, measurable period.

Patients presented to the veterinary surgeon seldom are given adequate preoperative care. Ordinarily the veterinarian does not have trained surgical aids available. Nor are his patients prepared with the technical care given human patients. The writer realizes that in small animal practice, in which cats may be a vital part, there is posed the problem of proper restraint for administration of anesthesia. With the above facts in mind, a careful study has been made of the approach to, and a standard operative procedure for, handling cats presented for surgery.

Chloroform or ether still is favored by many as anesthesia for cats. With the advance of medicine various new types of drugs of the barbital group have been added as anesthetic agents. Various forms have been recommended for administration intraperitoneally or intravenously. Dosage recommendations for intraperitoneal administration produced prolonged anesthesia in some animals and insufficient depth in others. Intravenous administration also was attended with difficulties and some familiar unpleasant experiences were not uncommon.

This report deals with the use of surital[®1] sodium (also known as thiamyial sodium) intrathoracically in cats or kittens.

This product was used without preanesthetic agents or other anesthesia. It has been employed on two-month-old kittens to aged cats of all breeds, including shorthaired domestics, Persians, Siamese, Abyssinians, and Manx. Surgery performed under anesthesia induced by intrathoracic administration of surital included: Teeth cleaning and extraction, nail trimming and removal of injured nails, lancing abscesses, removal of cysts, panhysterectomy, pyometra, castration, cesarean section, eye treatments, accident cases, repair of skeletal fracture, and for *x*-ray diagnosis, catherization, and urinary problems.

Except in accident cases, and in some rare instances such as emergencies, a rigid preoperative procedure has been followed. Clients are instructed to give 1 tsp. of karo[®2] syrup orally per day for two days to heighten blood sugar level and thus avoid the possibility of shock. Absolutely no food or water is given on the day animal is presented for surgery. This must be stressed to the client as it is important to prevent vomition.

Preparation

Solution is prepared by adding 25 cc. sterile, distilled water to 1 gm. of surital sodium. Care must be taken to avoid too vigorous agitation to effect complete solution. Do not use water with fluorides, chlorine, saline or dextrose solution as diluents.

Once the material is made into solution it is useable without refrigeration for a ten-day period. Solutions held longer than ten days should be discarded. Clear, yellow solution is standard. Cloudy solutions are questionable. When prepared as outlined, a one-gram vial of surital sodium costs 90c. This quantity can be used safely on eight, ten, or more animals, depending on weight. Cost per patient varies from 9c to 12c.

Administration

Dosage employed is 1 cc. for each 5 lb. of body weight intrathoracically administered with a 25 gauge, ½ in. needle at the cite caudad to heart area, about the eighth rib, and dorsal to the upper heart line level. Inject solution slowly, allowing ten seconds or more to complete. Surgical anesthesia develops quickly and without struggle within four to six minutes. There is no excitement stage or

[®1]Parke-Davis and Co., Detroit, Mich.

[®2]Corn Products Refining Co., Argo, Ill.

UNIVERSITY OF MICHIGAN LIBRARIES

respiratory failure. Margin of safety to the patient appears broad. Duration of anesthesia is 16 to 45 minutes. No respiratory stimulants are necessary and animals regain consciousness gradually without struggle or thrashing, or subsequent self-injury. Additional anesthesia may be given, if indicated, without danger by slow injection of ⅛ of the original dose at the original cite.

Of 100 routine feline surgical cases there were 98 successes and two failures. The latter included: One cesarean section performed as a life-saving emergency after the 67th known day of pregnancy. This patient was extremely toxic. The other was a young, unaltered tomcat that was fed a heavy meal prior to surgery. This fact was not made known until it had vomited and choked beyond help after the anesthesia had been given.

This solution, when given intraperitoneally, does not induce sufficient depth of anesthesia for surgical procedures. It was ineffective when used intramuscularly. When administered intravenously, satisfactory anesthesia results. Problems presented by smallness of the blood vessels in kittens, and restraint difficulties in mature cats are avoided by intrathoracic administration.

Summary

The writer is unaware of previous reports of intrathoracic anesthesia in cats for routine induction of surgical anesthesia. I feel that the technic employed is practical and dependable. It also possesses the virtue of relatively low cost and safety. It provokes complete relaxation without excitement and permits patients to regain consciousness without self-injury.

If precautions are taken regarding preoperative care as outlined, I have found administration of surital intrathoracically to be preferred as a most satisfactory method for inducing anesthesia in all ages of cats.

▾ ▾ ▾

ACTH In Small Animals

(*Continued from page* 362)

Treating a diabetic with insulin does not cure diabetes mellitus — rather, it controls the condition. Similarly, many intractable and drug-resistant diseases may be controlled through the judicious use of ACTH.

Administration

Under ordinary conditions, the most effective dosage level for ACTH is one unit per pound of body weight administered intravenously or subcutaneously. In more severe cases, this may be increased, while for maintenance purposes the lowest possible dose sufficient to produce desired response is advised.

Use of the hormone permits continuous therapy without rest periods where indicated, since it provides true stimulation of the entire adrenal cortex without causing involution. Where such prolonged treatment is given, it is well to add 1 gm. potassium chloride to the animal's daily diet. This prevents any possibility of development of a hypopotassemia. No toxic or untoward reaction to ACTH therapy has been reported during this investigation.

Summary

The general conception and rationale of ACTH therapy in small animals is presented with a brief review of the physiology of adrenal cortical hormones. A series of case reports are included which illustrate a number of clinical conditions affecting small animals, on which ACTH was found to be efficacious. In well over 1,000 cases, where the hormone was used in dogs and cats, it appeared to reduce inflammation, diminish or abolish pain from many causes, restore appetite and impart a general sense of well-being. When used at the recommended dosage level, no toxic or untoward reactions were observed in treated animals.

▾ ▾ ▾

Intramuscular Neomycin

(*Continued from page* 364)

REFERENCES

1. Waksman, S. A., Neomycin, New Brunswick, N. J., Rutgers University Press, 1953.
2. Drury, A. R., Evaluation of Neomycin Sulfate In Treatment of Bovine Mastitis. *Vet. Med.*, 47:407 (Oct.), 1952.
3. Braeutigam, H. M., Neomycin In Veterinary Practice. *N. Am. Vet.*, 35:26 (Jan.), 1954.
4. McCarty, R. T., Neomycin Sulfate Treatment of *Salmonella derby* Infection In Geese. *Jour. Am. Vet. Med. Assn.*, 122:386 (May), 1953.
5. Schweinburg, F. B., *et al.*, Effect of Oral Neomycin On Normal Intestinal Flora of Dogs and Man. *Proc. Soc. Exp. Bio. Med.*, 79:335 (Feb.), 1952.
6. Dickson, R. S., Neomycin Sulfate In *Salmonella dublin* Infection of Calves. *Vet. Med.*, 49:421 (Oct.), 1954.
7. Dickson, R. S., Neomycin Sulfate In Arizona Paracolon Infection of Calves. *Vet. Med.*, 50:143 (Mar.), 1955.
8. Poth, E. J., *et al.*, Neomycin, A New Intestinal Antiseptic. *Tex. Rept. Bio. Med.*, 8:353 (Fall), 1950.
9. Newberne, P. H., Treatment of Anomalies of The Eye In South American Chinchilla. *Vet. Med.*, 48:126 (Mar.), 1953.
10. Davidson, J. L., Neomycin Sulfate In Veterinary Dermatology and Ophthalmology. *Vet. Med.*, 48:239 (June), 1952.
11. Bicek, E. K., Neomycin, An Adjunct In Veterinary Surgery. *Jour. Am. Vet. Med. Assn.*, 124:105 (Feb.), 1954.

Modifications for Cesarean Section in Chinchillas†

FRANK A. HAYES,* A.B., B.S., and D.V.M.,
Athens, Georgia

The cesarean section for the chinchilla has been described in recent literature[1]. Although the technic given has saved the lives of many valuable females, postoperative complications have been far too great, with a considerable number of orphaned kits resulting. In view of these facts, an extensive investigational program has been conducted for improving methods of accomplishing surgical procedures. The following modifications are offered for consideration.

Changes in Technic

Ether has been employed extensively as an anesthetic of choice for chinchillas[1,2,3]. As a result, slow recovery with future pulmonary complications has been the rule rather than an exception. From all indications, the chinchilla patient does not tolerate ether as well as many of the domestic animals.

From these observations, correlated with recent experiences in local anesthesia[4], it is therefore recommended that a heavy sedative in combination with local infiltration, be used for pain abolition. Where the cesarean section becomes necessary, demerol®[1] (15 mg. intramuscularly) administered approximately 30 minutes prior to skin incision, will afford the necessary sedation[5]. A 1% cyclaine®[2] solution[6,7], injected subcutaneously in line with the anticipated incision, will produce a near perfect state of local anesthesia[6].

Recovery is immediate; the young will be nursing in a matter of minutes, and with many cases adults will begin food consumption within an hour following surgery.

Suture Material

A second factor of equal importance is the type suture material used for closure. Although a medium chromic catgut has been successfully employed as uterine, musculature, and skin sutures, postsurgical tissue reactions have been of paramount concern with a frequent occurrence of intestinal herniation and death. From all indications, irritation produced by the absorptive processes promotes the animal's cutting away the sutures prior to healing. A tremendous amount of swelling also has been

Fig. 1. Appearance of surgical wound 28 days postoperative.

†From the University of Georgia, School of Veterinary Medicine, Department of Pathology and Parasitology, Athens, Ga.
*Formerly Director of Research, Jessca Evergreen Chinchilla Ranch, Columbus, Ga. At present pursuing graduate studies as an Instructor, Department of Pathology and Parasitology, School of Veterinary Medicine.

®[1]Winthrop-Stearns, Inc., New York, N. Y.
®[2]Sharpe and Dohme & Co., Philadelphia, Pa.

associated with absorption of medium chromic suture material.

From recent studies the above difficulties have been avoided by substituting #000 plain catgut for sutures of the uterus as well as musculature and subcutis. In addition a prerequisite is to interlay a well constructed subcuticular suture line for skin apposition. As a rule, chinchillas do not tolerate surface sutures[1]. Employing the described type suture, the surgeon may anticipate complete healing within approximately four weeks (fig. 1).

Summary

The difficulties encountered in a previously described technic for performing the cesarean section in chinchillas have been outlined briefly. Two modifications to the original report have been discussed, whereby the veterinarian may experience a much higher degree of success in the specific operation, with an actual lessening of assistance required.

REFERENCES

1. Newberne, P. M. and Hayes, F. A., Cesarean Section in the South American Chinchilla. *Vet. Med.*, 49:246 (June), 1954.
2. Fish, R. D., An Unusual Chinchilla Pregnancy. *Jour. Am. Vet. Med. Assn.*, 124:226 (Apr.), 1954.
3. Lindsey, M. B., Chinchillas. *M. S. C. Vet.*, 15:22 (Fall), 1954.
4. Hayes, F. A., Amputation of an Appendage in Cinchilla. *Vet. Med.*, 49:432 (Oct.), 1954.
5. Hayes, F. A., and Newberne, P. M., Chinchilla Therapeutics: Dosage, Interval and Administration. *Auburn Vet.*, 11:11 (Fall), 1954.
6. Wheat, J. D., The Clinical Use of Cyclaine (Hexyclaine Hydrochloride) as a Local Anesthetic. *Jour. Am. Vet. Med. Assn.*, 120:71 (Feb.), 1952.
7. Bullard, J. F., The Use of Cyclaine as a Local Anesthetic. *Jour. Am. Vet. Med. Assn.*, 121:99 (Aug.), 1952.

▼ ▼ ▼

Post Graduate Continuation Courses for Veterinarians

The School of Veterinary Medicine, Texas A. and M. College, College Station, recently has announced a series of short, postgraduate, continuation fee courses for veterinarians. The purpose, as explained in a letter from Dean W. W. Armistead is: (1) "Help practitioners keep up-to-date; (2) promote a closer relationship between the college and the practitioner; and (3) encourage a few veterinarians to enroll for full scale graduate work toward advanced degrees."

In the first announcement, four one-day courses are projected and their detail schedule outlined. These are: (1) Clinical Laboratory Diagnosis (2) Postmortem Technic of Small Animals (3) Postmortem Technics of Large Animals (4) Ophthalmology.

It is understood that these will be expanded in proportion to their reception by veterinarians of Texas.

For further details, dates, programs, et cetera, write Dean W. W. Armistead, School of Veterinary Medicine, Texas A. and M. College, College Station, Tex.

▼ ▼ ▼

Michigan State College Honors Veterinary Scientists

Twelve nationally known leaders in the veterinary medicine and public health field received special Centennial Awards—at Michigan State College on June 27, 1955.

A special symposium, which brought leading scientists of the nation together to discuss one of the livestock industry's greatest problems, Reproduction and Infertility, was one of ten being held on the East Lansing campus during Michigan State's one-hundredth year. Awards were presented at the banquet following the first day of sessions.

The special Centennial Awards are being conferred by Michigan State "for outstanding contributions to society, for achieving distinction in their endeavors, and for setting the highest standards of accomplishment."

Those to receive the awards include: Dr. J. H. Steele, U. S. Public Health Service, Atlanta, Ga.; Dr. L. M. Hutchings and Dr. L. P. Doyle, Purdue University, Lafayette, Ind.; Dr. W. R. Hinshaw, Chief, Virus and Rickettsine Section, Camp Detrick, Md.; Dr. Wayne Riser, Skokie, Ill.; Dr. H. H. Dukes, Cornell University, Ithaca, N. Y.; Dr. J. A. Reyniers, University of Notre Dame, South Bend, Ind.; Dr. Gail Dack, University of Chicago, Chicago, Ill.; Dr. Lee Roderick, Kansas State College, Manhattan, Kans.; Dr. L. C. Ferguson, Ohio State University, Columbus, Ohio; Dr. Hadley Marsh, Montana State College, Bozeman, Mont.; Dr. F. R. Beaudette, Rutgers University, New Brunswick, N. J.

▼ ▼ ▼

If you have a few disgruntled clients (who complain constantly) hang on to them—they may be responsible for keeping your practice on its toes. To keep them happy, you may be doing some of the things that will benefit your other (satisfied) clients.

Malaria in Canaries†

WILLIAM J. MATHEY, JR., B.S., V.M.D., Ph.D., Davis, California*

A canary breeder, who raised canaries to supply pet shops, came to the author for diagnosis and advice concerning a disease in his birds. About five days previously, five birds had died. A few had died every day since that time, making a total of 20 dead of 700. (In all, until control measures became effective, 165 of 700 were lost.) The owner stated that the birds were visibly sick only a few hours. The eyes in some, according to the owner, were swollen.

On examination of two live and three dead birds, it was seen that there were swellings about the eyes. These proved to be subcutaneous hemorrhages. The most noticeable change on autopsy was a great enlargement of the liver and spleen. These organs were enlarged about 3X and 5X respectively, and were grayish brown, resembling chocolate that has been refrigerated.

Cultures from the heart, liver, and spleen were made on tryptose blood agar plates. Cultures were made from the trachea by the method of Adler, *et al.*[1]. Negative results were obtained on all culture media.

Impression smears were made from the surface and from cut sections of the spleen. Some of these were stained with Machiovello's and others with Giemsa stain. Blood smears were made from heart blood and stained with Giemsa stain. Bodies were seen in erythrocytes, and in the spleen outside erythrocytes. Further study revealed these to be *Plasmodium cathemerium*.

This finding of malarial parasites brought new light on one statement of the owner that about two weeks previously he had, due to the hot weather, removed the windows from his aviary, leaving only a ½ inch wire mesh screen for protection.

It was recommended to him that he put up mosquito-proof screens on every opening into the aviary, and that he spray the interior with an insecticide to eliminate any mosquitoes living in the building. In addition, it was recommended that he treat the birds with atabrine at the rate of 0.24 mg. per gm. of body weight per day, which comes to about 7.5 mg. a day for a one-ounce canary. This dosage was based on Manwell's[2] work with *Plas. hexamerium*.

Losses stopped one week after instituting treatment and screening the windows. The atabrine appeared to have some effect on a few visibly sick birds, since they regained normal health after treatment.

Discussion

The canary is susceptible to a wide variety of avian Plasmodium species, so much so that it is perhaps the most widely used experimental animal in malarial research[3].

This very susceptibility of the canary makes it necessary to keep it in an effectively screened area to prevent transmission of disease by infected mosquitoes. These insect vectors are likely to occur anywhere, since wild birds in many sections of the country have been found infected with various Plasmodia[4,5].

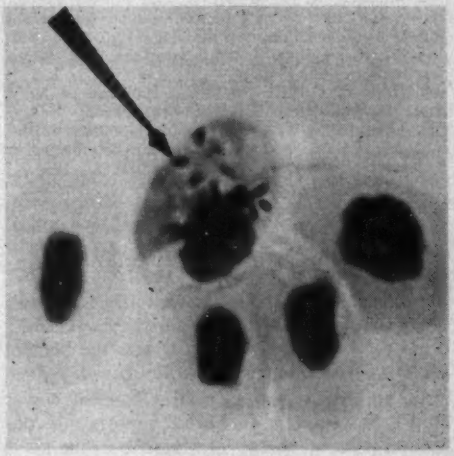


Fig. 1. Gametocyte of *Plasmodium cathemerium* in canary erythrocyte. Note rod-shaped pigment granules (arrow) in the parasite. The parasite fills about three-fourths of the erythrocyte.

The veterinarian who handles a pet practice should be alert to the possibility that bird malaria may affect his avian patients and should be prepared to offer advice concerning treatment and prevention.

In handling canaries or other small pet birds, it is important to remember that these birds often die of fright or excitement. The client should be warned of this possibility.

A blood sample for examination for Plasmodium may be obtained by cutting one of the toenails short. The drop of blood obtained in this way is smeared on a slide, fixed with methyl alcohol, and stained with Giemsa stain. In some samples, a high percentage of cells may be parasitized. In others, it may be nec-

†From the School of Veterinary Medicine, University of California, Davis.
*Present Address: University of Georgia, Athens.

essary to hunt through many fields to find the parasites.

The greatly enlarged liver of birds severely affected with malaria may be seen if the belly wall is first wiped with alcohol or other fluid to make the skin more transparent.

Summary

An outbreak of avian malaria in a canary breeding flock, caused by *Plasmodium cathemerium* and apparently spread by mosquitoes, is reported as causing approximately 25% loss.

REFERENCES

1. Adler, H., Yamamoto, R., and Bankowski, R., A Preliminary Report of Efficiency of Various Mediums for Isolation of Pleuropneumonia-Like Organisms from Exudates of Birds with Chronic Respiratory Disease. *Am. Jour. Vet. Res.*, 15:463, 1954.
2. Manwell, R. D., Alpert, S., and Powers, D., Experimental Chemotherapy of *Plasmodium hexamerium* Infections. *Jour. Parasit.*, 39:209, 1953.
3. Hewitt, R., Bird Malaria. *Am. Jour. Hyg.* Monographic Series 15, 1940.
4. Herman, C. M., The Blood Protozoa of North American Birds. *Bird Banding*, 15:89, 1944.
5. Love, G. J., Wilkin, S. A., and Goodwin, M. H., Incidence of Blood Parasites in Birds Collected in Southwestern Georgia. *Jour. Parasit.*, 38:52, 1953.

▼ ▼ ▼

Better Nutrition for Pets

Modern medicine has raised the American dog's standard of living so much that the dogs often eat better than the kids, says the current (June 18) issue of *The Saturday Evening Post*.

In an article entitled, The Pooches Never Had it So Good, J. C. Furnas reports the contention is based on the striking rise in the average quality of commercial dog foods in the last 20 years. "And that," he comments, "is a principal cause of one of the few really admirable developments in the last dreadful score of years: Our dogs are living longer."

Furnas reports that all dogs—toy or titanic, mongrel or pure-bred, now can benefit from new veterinary wrinkles, of which improved nutrition is just one. He tells of the developments at Rutgers University's Bureau of Biological Research, where scientists think that the possibility of better nutrition for dogs, and men, has barely been glimpsed.

One avenue already open, he says, is the "prescription diet"—special dog foods for special clinical needs and obtainable only on prescription from a veterinarian. "They work so well that, wouldn't you know, a black market in them has sprung up in the Middle Atlantic states," Furnas says. "The makers hope to keep it under control."

LaFond Memorial Edition of Planning Your Animal Hospital Proposed

The Lou LaFond Memorial Committee of the American Animal Hospital Association recently closed its fund-raising drive for an appropriate memorial to Doctor LaFond who was so instrumental in improving facilities standards of Association members.

A sum of $1,900. was collected which will be used to expand, and rewrite the small textbook, Planning Your Animal Hospital. The first edition is practically sold out at cost-of-publication price. Work on the new edition will commence soon after September 1 by Executive Secretary Wayne H. Riser and his staff. Members of the A.A.H.A. are being solicited at this time for ideas on how the LaFond edition can serve the profession best.

▼ ▼ ▼

First Annual Meeting of Dog Food Manufacturers

The first convention ever to be held exclusively for dog food manufacturers will take place in Chicago this fall. The convention is being sponsored by the Dog Food Division of the American Feed manufacturers Association.

President Walter Kendall forecast that several hundred leading industry men well be in attendance to hear some of the nation's most outstanding speakers discuss subjects of primary concern to dog food manufacturers. Subjects to be covered during the two morning sessions will include health, disease and nutrition of the dog, package design, sales motivation, showmanship, and merchandising and market analysis. Among featured speakers is Dr. Clive McKay well-known canine nutritionist, researcher, teacher, and author.

Advance hotel and convention registration is being handled through the American Feed Manufacturers Association office at 53 West Jackson Blvd. Chicago, Ill. Inquiries should be directed there.

▼ ▼ ▼

Car Chasing Dogs

The Veterinary Column in *Successful Farming* for July 1955, suggests that a short chain on which is suspended an 8 in. length of broom handle fastened to the collar will break a dog of chasing cars. The apparatus allows normal walking but interferes with running.

statutes examined. It was decided that the present law should be amended. This amendment was passed by the General Assembly of North Carolina on April 27 and gave the Commissioner of Agriculture the power to prohibit the shipment, into North Carolina, of any manufacturing material which is infectious for man or livestock. Under this statute, the Governor must first issue a proclamation giving the Commissioner the power to act.

During May 4-8 a rapid survey was made of several textile plants in the New England and Philadelphia areas. The purpose of this trip was to determine, if possible, the precautions that are being taken to prevent human cases of anthrax in plants processing foreign, imported goat hair. It was shocking and discouraging to observe the existing conditions in many of these plants. It is the writer's opinion that the majority of reports concerning the many things that are being done to prevent industrial anthrax are overly optimistic. There was a complete lack of guidance, supervision, or regulation of these plants by local and state health departments. One suspects human cases are greatly under-reported. Personal hygiene measures needed so greatly in this industry were badly lacking. Management was quite indifferent to the problem, and perhaps the indifference on the part of public health departments has been largely responsible for this attitude of industry.

Anthrax is not the only problem in these plants. Q fever, tetanus, gas bacillus, blackleg, and other organisms pathogenic for man and animals exist in these environments.

A most interesting question to those of us investigating the North Carolina plant was why there had been no pulmonary anthrax infections among the workers. The large particle size of the anthrax organisms was thought to be the main reason. Therefore, on April 24 an attempt was made by a team of investigators to determine the air concentration and particle size range of *B. anthracis* in this plant. Two hundred surface samples were collected and one hundred and nine proved positive for anthrax. Theoretically, it was pointed out by investigators that a person working eight hours a day in this plant would inhale a minimum of 27 clumps of *B. anthracis*.

The meeting was held in Washington, D. C. on May 8 and, as predicted, no concrete action was taken. Many of those present felt that there was little that could or should be done simply because penicillin is effective on human cases and the number of cases reported was so "small". I do not subscribe to these arguments. It was finally agreed that another conference between federal agriculture and health officials should be held.

Returning to Raleigh, we decided that we had waited long enough and that action should be taken. A proclamation was issued by the Governor. It was not necessary for the commissioner to act under this proclamation, however, because at this time the management agreed, on May 18, to autoclave all future shipments of goat hair in Philadelphia at 15 lb. pressure at 120 C. for one hour. (The management rejected this suggestion on March 25, stating that autoclaving would ruin the hair for weaving purposes, but now claims that autoclaved hair weaves better and there is less dust.) It was also agreed that the North Carolina plant would close down until a thorough cleanup and disinfection of the plant and premises could be carried out. This was done. The entire building and all equipment was vacuum cleaned and scrubbed. The machines were washed with 20% formaldehyde and treated with a solvent to prevent rusting. The interior of the plant was sprayed with a 20% formaldehyde powder paint spray and the floors were soaked in formaldehyde. The ground around the plant for some distance was treated with formaldehyde. The management is now pleased that this action was forced upon them. Three periodic follow-up inspections have failed to demonstrate anthrax organisms in this plant.

Conclusions

Our experience has created doubt as to the place of importance that this disease has as a public health problem. I sincerely believe that it needs more attention than is presently being given to it. It is time that federal officials, both in agriculture and public health, investigate thoroughly the conditions existing in these plants and take necessary action toward protecting the various states against the interstate shipments of contaminated material. A truck which hauls anthrax-infected hair from Philadelphia to North Carolina one week may be hauling animal feed to another state the next week without prior disinfection. Animal hair is the most hazardous of all products imported. It can be sterilized.

NOTE. I should like to state that the success of this investigation was due largely to the fine assistance and cooperation which our state and county officials received from scientists, veterinarians, and physicians from the U. S. Public Health Service.

Note: Since this article was written, another human anthrax case has been reported in this textile mill. Investigation is under way to determine if the plant has been recontaminated.

REFERENCES

1. Wolff, Arthur H., Heimann, Harry, Industrial Anthrax in the United States. *Am. Jour. of Hyg.*, 53:80 (Jan.), 1951.

2. History of Outbreak of Anthrax in Guilford County. Unpublished data on file at N. C. State Board of Health, Raleigh, 1931.

3. Outline of Hair and Wool Sterilization Process. World Health Organization. F.A.O. Expert Group on Zoonoses, First Session, Geneva, December 11-16, 1950. Appendix 4.12.

▼ ▼ ▼

Harmones for Growth and Fattening

(*Continued from page* 346)

and Weir, W. C., A Comparison of the Effect of Stilbestrol on the Growth Response of Lambs of Different Age and Sex. *Jour. An. Sci.*, 14:178, 1955.

26. Jordan, R. M., and Dinusson, W. E., Effects of Stilbestrol on the Growth Rate of Suckling Lambs. *Jour. An. Sci.*, 9:380, 1950.

27. Perry, T. W., Andrews, F. N., and Beeson, W. M., The Effects of Stilbestrol on Suckling Lambs. *Jour. An. Sci.*, 10:602, 1951.

28. Jordan, R. M., Effect of Stilbestrol, Stilbestrol-Progesterone Implants on Fattening Lambs. *Jour. An. Sci.*, 12:948 (Abstr.), 1953.

29. Bell, T. Donald, Smith, Walter H., Erhart, Andrew B., and Holland, Lewis A., The Effect of Stilbestrol and Stilbestrol-Progesterone Implants upon the Feed Lot Performance, Carcass Qualities, and Reproductive Organs of Ewe and Wether Feeder Lambs. *Jour. An. Sci.*, 13:966 (Abstr.), 1954.

30. Jordan, P. S., Jordan, R. M., and Groom, H. G., Lamb Feeding Trials 1954-55, University of Minnesota Animal Husbandry Department Report. Morris S-45, 1955.

31. Burroughs, Wise, Culbertson, C. C., McWilliams, R. M., Kastelic, Joseph, and Hale, Williams, Hormone Feeding (Diethylstilbestrol) to Fattening Cattle I. Iowa State College, A. H. Leaflet, 188:7, 1954.

32. Culbertson, C. C., Burroughs, Wise, Kastelic, Joseph, and Yaerger, Roger, Results Using a 65-35 Corn and Cob Mixture for Fattening Cattle. Iowa State College, A. H. Leaflet, 190:5, 1954.

33. Culbertson, C. C., Burroughs, Wise, Kastelic, Joseph, Hammond, W. E., and Cheng, Edmund, Different Feeding Levels Diethylstilbestrol for Fattening Steers. Iowa State College, A. H. Leaflet 194:4, 1954.

34. Burroughs, Wise, Culbertson, C. C., Kastelic, Joseph, Cheng, Edmund W., and Hale, William H., Oral Administration of Diethylstilbestrol for Growth and Fattening in Beef Cattle. *Jour. An. Sci.*, 13:978, 1954.

35. Deans, R. J., Van Orsdell, W. J., Reineke, E. P., and Bratzler, L. J., The Effect of Progesterone-Stilbestrol Implants on Rate of Gain and Carcass Characteristics of Steers. *Jour. Ani. Sci.*, 12:901, 1953.

36. Stob, Martin, Andrews, F. N., Zarrow, M. X., and Beeson, W. M., Estrogenic Activity of the Meat of Cattle, Sheep, and Poultry Following Treatment with Synthetic Estrogens and Progesterone. *Jour. An. Sci.*, 13:138, 1954.

Zoological Classification of Turkeys

Zoologically, turkeys belong to the family Meleagrididae of the order Galliformes. Only two living genera are represented in the family Meleagrididae. One of these called Agriocharis represented by a single species called *A. ocellata* is the Yucatan or occellated turkey. It is a wild turkey confined to the Yucatan peninsula and adjoining territory in Mexico and has never become domesticated. The second genus Meleagris likewise is represented by a single species *M. gallopavo*, the North American turkey. A number of well known varieties of this domesticated species are found on farms of the world. These varieties include Broad Breasted Bronze, Bourbon Red, White Holland, Narragansett, Beltsville White, and Broad Breasted White.

▼ ▼ ▼

Increased Floor Space for Broilers Saves Feed

At the South Carolina Experiment Station, broilers given a square foot of floor space increased their weight 10 to 12% over birds raised on one-half a square foot allowance. Feed efficiency improved 5% in one experiment and 15% in another. Feather picking was eliminated and breast width improved.

M. A. Boone, associate poultryman, who supervised the experiment, believes that under tight market conditions increasing the floor space per bird could make the difference between profit and loss to the grower.

"A 5% increase in feed efficiency," Boone points out, "means a saving of 3,000 lb. of feed for every 5,000 broilers and increased weight means getting the birds to market sooner at better prices."

▼ ▼ ▼

According to Qurantu (*Science Digest*, 36:1 [Oct.], 1954) birds, as well as other animals, vary in their ability to distinguish various colors. Chickens are able to distinguish between red, yellow, green, and blue-green, and have maximum sensitivity to yellow-green. Pigeons also have maximum sensitivity to yellow-green, and can distinguish red, yellow, green, blue, and violet. The owl has no color vision.

▼ ▼ ▼

Lack of riboflavin, (Vitamin B_2) can cause skin eruptions in most animals. In growing chicks the first sign of this deficiency is curled toes.

EDITORIAL COMMENTS

Veterinary Examination and Licensure

The National Board of Veterinary Medical Examiners, organized in 1950, comprises a membership of 30 members representing all fields of veterinary medicine. Its president is Dr. C. W. Bower, Topeka, Kans.

The purpose of the National Board is to assist state examining boards in providing an objective examination for licensure that will replace the present essay-type examination given in most states. Kansas, California, and Connecticut used the suggested objective examination in 1954 with reported satisfactory results. These three used the examination again this year (1955) and Alabama, Minnesota, Oregon, Maryland, and South Dakota also gave the plan initial trial. Eight other state boards have indicated interest.

Among the advantages of the objective examination service described is that it permits accurate and rapid machine scoring, thus eliminating the laborious grading task entailed by essay-type examination. Reciprocity matters remain to be worked out.

▼ ▼ ▼

Veterinary Colleges in the Americas

Report prepared by the Pan American Congress of Veterinary Medicine lists 42 schools in North and South America offering professional training leading to degrees in veterinary medicine. Eleven of these were established during the ten-year period, 1940-1950.

Number of graduates per school was smaller in 1953 than in 1944. Facilities generally are estimated to be adequate to handle larger numbers of students in at least half those institutions listed without lowering quality of instruction. These facilities should be employed to the maximum before consideration is given to the establishment of more new schools, according to the report.

▼ ▼ ▼

Contrary to popular belief, it is cheaper to raise the "meat type" hog than the lard type, according to Robert Grummer of the Wisconsin Experiment Station. Grummer found that the meaty type made 100 lb. of gain for each 431 lb. of feed consumed. Other hogs needed 466 lb. for the equivalent gain.

Higher Entrance Salary for Government Positions as Veterinary Specialist

The U. S. Civil Service Commission has just approved a request initiated by the Agricultural Research Service for an increase in the beginning salary of GS-7 veterinary positions from $4,205. to $4,830. per annum. In the future, veterinarians with less than one year of professional experience, will be appointed at the $4,830. salary rate and will have excellent opportunities for advancement to grade GS-9 at $5,060. per annum upon the satisfactory completion of six months' service and training in the Agricultural Research Service.

Those who have had at least one year of professional veterinary experience may be appointed initially in grade GS-9, at $5,060. per annum. Openings for veterinarians exist in both meat inspection and livestock disease control and eradication activities.

Recent improvements in the grade structure of veterinary positions in the Agricultural Research Service have greatly enhanced the opportunities for promotion above grade GS-9 of those employees who demonstrate initiative, efficiency, supervisory ability, and the other attributes essential to effective functioning in the higher grade positions.

Veterinarians who are interested in employment in either grade GS-7 or GS-9, depending upon their qualifications as indicated above, are encouraged to communicate with the Personnel Division, Agricultural Research Service, U. S. Department of Agriculture, Washington 25, D. C.

▼ ▼ ▼

Texas A. & M. scientists believe that the value of antibiotics for control of chronic respiratory disease (CRD) in poultry probably lies in elimination of secondary infections rather than in control of the virus disease itself.

▼ ▼ ▼

Washington Dairygrams, a *Hoard's Dairyman* feature (June 25, 1955) advises that a dairy farmer cooperative is under scrutiny by government officials for monopoly practices or acting in restraint of trade. The cooperative in question recently purchased a milk plant. Legal action, according to this editorial, could have nation-wide impact.

The Ingredients of a Good Business

The following abstract of article appearing in *Scope* magazine for industry, London, England for April 1955, is quoted from *Executive's Digest*, June 1955.

"First: The business should be profitable. 2. There should be ample scope for expansion. 3. It should be stable. There should be no risk of the production or service becoming obsolete. 4. It should be as simple as possible. 5. Capital tied up in stocks should be a minimum. 6. It should be a leader in its field. 7. There should be some guarantee that leadership will be maintained. 8. There should be a progressive and optimistic atmosphere. 9. It should not be a dishonest or trick business where the main object is to get money out of other people's pockets into our own. 10. It should be a business that offers something good to society so that in pursuing it we feel happy that we are doing a useful job."

The ten points enumerated above apply to the business of veterinary practice as surely as they do to any sort of business venture involving trade in items or services.

▾ ▾ ▾

Doctor of Science in Veterinary Medicine Degree Offered at Cornell University

A new degree, Doctor of Science in Veterinary Medicine, has been established at Cornell, the first university in the United States to offer it.

The D.Sc. in V.M. will be a professional degree for advanced study in such clinical practices as medicine, surgery and therapeutics, according to Dean William A. Hagan of the Veterinary College.

"Specialization in veterinary medicine has reached a point where the traditional Ph.D. program no longer suffices for all the various types of advanced training that are needed," he stated.

Cornell will continue to offer a Ph.D. degree with a major in veterinary medicine, for persons doing original research in such basic sciences as anatomy, bacteriology, physiology, and pathology.

A new division of veterinary medicine in the Cornell Graduate School will administer the D.Sc. in V.M. Applicants for admission must have graduated from an approved school of veterinary medicine at least five years previously, and must have published papers demonstrating their ability for independent research. Candidates with no graduate credit beyond their D.V.M. degree must complete at least two years of full-time study for the doctor's degree, while candidates with a master of science degree must complete at least one year.

▾ ▾ ▾

Pennsylvania Graduate School of Medicine Opened to Veterinarians

The University of Pennsylvania's Graduate School of Medicine, whose students are graduate physicians and dentists, will offer courses for doctors of veterinary medicine next fall for the first time.

The announcement was made by Dr. George Morris Piersol, dean of the Graduate School of Medicine, and Dr. Mark W. Allam, dean of the University's School of Veterinary Medicine.

One purpose of the new courses is to prepare veterinarians for full-time teaching and research work in veterinary schools, where qualified clinicians are needed urgently, Doctor Allam said.

The courses, leading to the degree of master of veterinary medical science, in clinical specialties, will stress broad education in the basic medical sciences and their correlation with the diagnosis and treatment of clinical problems.

Facilities of the School of Veterinary Medicine and its 220-acre New Bolton Center, near Kennett Square, Pa., as well as those of the Graduate School of Medicine, will be used.

▾ ▾ ▾

"Desirable Cooperation"

The heading above designates an editorial in *Feedstuffs*, a weekly newspaper serving the animal feed industry, in which are comments favorable to some basic suggestions for cooperative efforts of feed men and veterinarians. These were contained in an article by Dr. Morris Erdheim, which appeared in the July issue of VETERINARY MEDICINE (*Vet. Med.*, 50:309 [July], 1955).

Service to the livestock industry is the foundation on which the bagged feed industry has built. Less sincere efforts would certainly not have supported the tremendous growth and general acceptance that mixed mill feeds enjoy today.

Cooperation of veterinarians and feed people, as well as other groups giving sincere service to growers of meat animals, is most desirable.

Newson Memorial Fund

A Memorial student Loan Fund is being sponsored by the Colorado Veterinary Medical Association in memory of the late Dr. I. E. Newson, who was associated with Colorado A. and M. College at Ft. Collins for more than 50 years in positions from teacher to president. Doctor Newson was extremely active in association work and endeared himself through the years not only to his students but to a large segment of the livestock industry by reason of his energetic efforts as a professional man.

It is proposed that the fund be self-perpetuating and available to deserving upper classmen and graduates of the School of Veterinary Medicine. All alumni and friends are invited to forward their contributions (amount suggested —$5. for each year out of college) to Dr. A. C. Herzberger, 2910 East Highway 24, Colorado Springs, Colo., chairman. This will be the only general effort to make a drive for principal funds which will be administered by designated authority at the College.

▼ ▼ ▼

A safe place during a thunderstorm is inside an automobile, but a tractor seat can be a dangerous spot. The car's metal shell provides "lightning rod" protection.

Field Diagnosticians Complete Foreign Animal Disease Training School

Twelve veterinarians of the Animal Disease Eradication Branch, Agricultural Research Service, USDA, completed, on June 10, a special four-week training school for animal-disease diagnosticians. The course embraced intensive and specialized study on differential diagnosis of foreign livestock diseases.

USDA and Public Health Service disease specialists provided intensified instruction. Diseases covered in the course of instruction were rinderpest, the vesicular diseases, scrapie, bluetongue, Teschen disease, African swine fever, and other exotic diseases.

This is the third in a series of training courses that have been given over the past three years in Washington and at the Beltsville, Md., Animal Disease Station. Purpose of the training is to provide the best possible defense against outbreaks of dangerous foreign animal diseases within the United States.

▼ ▼ ▼

On the basis of value of retained carcasses condemned for tuberculosis in 1916 and now, annual savings due to reduced incidence of this disease is estimated to approximate $150,000,000.

Field Diagnosticians Complete Foreign Animal Disease Training School

Participants in the training program included (left to right): Drs. J. H. Sikes, Jr., Georgia; Mathias J. Kemen, Jr., Vermont; Glen O. Schubert, Minnesota; James M. Fancher, Pennsylvania; Lewis E. Seay, Texas; Herbert Racoff, South Carolina; Robert J. Anderson, chief, Animal Disease Eradication Branch, Washington, D. C.; William L. Wake, Virginia; Norvan L. Meyer, Indiana; Frank Delaplane, Florida; William E. Wiseman, Ohio; Donald W. Johnson, Michigan; and William W. Moulton, Maryland.

Travel Accidents

"The nation's number one killer is claiming a life every five minutes; is maiming and disabling someone every twenty-five seconds." Newspapers reported 368 killed over the past July 4th holiday period. In one city, Chicago, the traffic toll so far this year is 171 killed, 16,411 injured.

Peter N. Jans, manager of a special travel-accident insurance plan for veterinarians, makes this statement to dramatize the need for protection against the appalling number of automobile and travel accidents which, in 1954, took 36,000 lives and injured close to 2,000,000 persons. Pointing out that many persons are becoming immune to statistics, Jan said we must learn to think of this killer in personal terms.

"One of 80 persons will be injured or killed —violently—in automobile or other travel accidents during 1955. Translated personally that means that someone you know, a member of your family, or even you may be a victim this year. Those are low odds when your life or health is at stake," Jans said. "It just isn't realistic to think you can never be one of those statistics."

Bringing the facts closer to veterinarians, Jans said that professional and business men have the third highest automobile accident rate of all occupational groups. This makes the odds even worse for the veterinarians. He stated that automobile accidents alone resulted in a $100,000,000. bill for medical care and cost $1,250,000,000. in lost wages. If the veterinarian wants to avoid staggering financial losses, "travel accident insurance is a must."

Fortunately, veterinarians are realizing the need for adequate travel protection—not only for their professional activities, but for their other travel activities as well, and they are supporting the insurance plan now offered them. This travel-accident plan for veterinarians pays a lump sum for accidental loss of life or limb, a specified amount for medical and hospital charges and a weekly indemnity for total disability. The plan covers policyholders not only while driving an automobile, but when riding in any conveyance, walking, flying as a passenger in specified aircraft or operating any land or sea vehicle not for hire. It is written exclusively for members of the veterinary profession by Continental Casualty Company.

Scrapie Confirmed in California

A Suffolk ram in a flock near Thornton, San Joaquin County, Calif. has been ascertained by federal and state livestock disease authorities as being affected with scrapie.

In announcing the discovery of the diseased sheep, the California Department of Agriculture said that the ram was destroyed and the flock of 217 sheep quarantined to prevent spread.

The ram is believed to have been brought into California from Oregon. After the animal was destroyed, a portion of the brain was sent to the USDA Animal Disease Laboratory in Beltsville, Md. which confirmed clinical diagnosis.

Scrapie has not been discovered in California since August, 1952, when the disease was reported for the first time. Thousands of exposed sheep were slaughtered before the disease was believed to have been eradicated.

▼ ▼ ▼

"Nutrition Practices in Human Health"

Public health officers everywhere have the responsibility to include nutrition education as a part of a community health program is the recommendation of a new publication of the American Public Health Association.

"Nutrition Practices" describes the role of nutrition in modern public health practice. This Guide for public health administrators is the result of two years of study by a subcommittee of the Association's Committee on Administrative Practice. Their combined efforts have produced an authoritative guide to the administration of public health nutrition programs and for the evaluation of nutrition services.

Nutrition is an essential part of any competent public health program, says the Guide. The responsibility of public health in this field is essentially educational — the guidance of both individuals and groups. Public health shares with the medical profession and voluntary agencies responsibility for a program of preventing nutritional disorders, establishing sound eating habits, and maintaining desirable weight.

▼ ▼ ▼

Estimates place cost of swine ascarids at $75,000,000. annually; approximately $1.25 per animal due to injury and retarded growth.

PRINCIPLES OF ANIMAL HEALTH

R. R. DYKSTRA, D.V.M.
Manhattan, Kansas

Collection of Samples for Diagnosis of Trichomonads

The best methods for the collection of diagnostic material from a bull's sheath in cases of suspected trichomoniasis that are available to most practitioners are at least two in number: (1) The saline irrigation method, and (2) the swab method.

In the first method the area surrounding the sheath opening is thoroughly cleaned and disinfected. A luke-warm sterile saline solution to the extent of 250 ml. is permitted to flow into the sheath, the exit of the latter being held closed while the saline is manipulated (manually or digitally) throughout the sheath. The saline then is collected, centrifuged, and microscopically examined on a glass slide. If present, motile protozoa are readily detected. The usual preliminary cleansing preceeds the employment of the swab method. A piece of sterile cotton attached to a stiff wire holder, or held in a long handled forcep, is introduced into the sheath for a distance of 10 to 12 in. and rotated on its long axis. During this manipulation the penis is being kept from retraction by being held from outside the sheath. This latter step is quite essential as most trichomonads, if present, are lodged just back of the glans, and it is necessary for the swab to contact this area. After withdrawal of the swab it is pressed against the inside of a large caliber test tube or other suitable vessel to which has been added a small amount of sterile saline solution which is then examined microscopically. Excepting only when the trichomonads are present in small numbers these methods are satisfactory. However negative results, because of small numbers of organisms are best checked by repeated examination of specimens collected every three days by either douching or swabbing.

▼ ▼ ▼

Stilbestrol (diethylstilbestrol) continues to be an item of interest to beef cattle feeders because of increased gains resulting from its use as a feed supplement. It is not detectable either antemortem or postmortem, and therefore there is no adequate reason, expediency excepted, for dockage. Animals fed the estrogenic substance dressed out as well as those not receiving it.

Effect of High Temperatures on Fertility of Bulls

During the Veterinary Conference at Kansas State College June 2, 3, and 4, 1955 it was stated among other things in a presentation on the subject of bovine sterility that, "Extreme high outside temperature is one of the causes of poor fertility in the male. The scrotal region should have a temperature at least two degrees lower than that of the rest of the body". During extremely hot days the bull should be kept in an area of temperatures lower than the immediately surrounding area, or in addition cooling applications to the scrotum were suggested.

▼ ▼ ▼

Irregularities of Disease Control Measures

It is an anomaly that control of disease tends to spread disease. In this respect Dr. B. T. Simms, chief of the Animal Disease and Parasite Research Branch, A.R.S., USDA, in his report during the 58th annual meeting of the U. S. Livestock Sanitary Association, sums up the situation as follows: "As long as tick fever was present in the South and a quarantine prevented the movement of cattle from southern farms and plantations to tick-free northern areas, the small stomach worm, *Ostertagia ostertagii*, remained restricted to the South, but when ticks were eradicated and quarantines revoked this parasite moved north with southern cattle. And when cattle from tick-free northern areas could be moved into the South and southeast United States, tuberculosis moved in with them." This means, then, that up to the present time research and control of animal diseases has never caught up with the new and urgent problems that are continually arising.

▼ ▼ ▼

Some time ago we mentioned the frequency of occurrence of "jowl abscesses" in swine as observed in many midwestern packing plants. Now comes a federal veterinary inspector that raises the question of the preinfection influence of swine feeding troughs as an etiological factor in this condition.

VETERINARY NUTRITION

MORRIS ERDHEIM, D.V.M.
Chicago, Illinois

Unidentified Nutrients

Unidentified nutrients have been part of our armamentarium for years for use in feeds and for treatment of some disease conditions. Many of these have long since been identified. Thus, the unidentified nutrient in fish liver oil which was used to prevent and control rickets, was found to be vitamin D.

While the vitamins with which we are familiar are no longer in the unidentified nutrient class, some important factors are, as yet, unidentified. These cause a response in birds or animals which can not be explained on the basis of the known nutrients. For the most part, they have been concentrated but not yet isolated or chemically identified.

While there is some question about the proper classification of unidentified nutrients, they may be broken down into the following three classes:

1. The "fish factor." This is found in condensed fish solubles, fish meal, liver meal, meat products, and fermentation products.

2. The "whey factor." This is found in dried or condensed milk products, yeast, and fermentation products. Some workers report that orotic acid and methionine combined may replace the whey factor.

3. The "alfalfa" or "grass juice" factor. This is found in forage juice, alfalfa meal, and other green feeds.

These nutrients function in a variety of ways, depending on the kind of animals or birds fed and the environmental conditions under which they are reared, the formula in which they are included, and other conditions. The most sought after result is growth stimulation in meat birds (broilers) and pigs. When added to good practical rations, unidentified nutrients may account for an additional 10% growth.

In poultry, some reports suggest that unidentified nutrients improve egg production and hatchability. There is a definite carry-over of these factors from hens to their chicks. If the hens receive an ample supply in the breeding ration, chicks will show relatively little need for additional amounts. On the other hand, chicks which were hatched with low supplies of these nutrients, will show dramatic response when they are fed unidentified factors in their rations.

The quantity of concentrated sources of these nutrients needed for a ration depends on the ration. Some contain high levels of natural feedstuffs which are relatively rich in these factors. A broiler feed may contain 5% or more of fish meal which is a source of the fish factor. However, this ingredient is frequently in short supply and may be a rather expensive source of protein. Nutritionists, therefore, find it desirable to replace much of the fish meal with a less expensive source of protein, and supply the "fish factor" from a more concentrated source such as one of the fermentation products.

It has been reported by Couch of Texas, that chicks in new, clean quarters did not show adequate growth response to the unidentified factors as did chicks in unsanitary surroundings. It is believed that unsanitary surroundings involve a high disease level which raises the requirement for the unidentified growth factors.

Unidentified Nutrients for Ruminants

The rumen microorganisms are responsible for breaking down and digesting cellulose of roughage. This process is called cellulolytic activity. Since researchers have become more familiar with the rumen fistula and the artificial rumen, more work has been done with rumen microbiology and physiology. Early reports in this field indicate that a number of familiar ingredients contain "unidentified factors" which increased the cellulolytic activity of the rumen organisms. This factor (or factors) may be found in alfalfa hay and is known as the "alfalfa ash" factor. Similar cellulolytic activity has been found in fermentation products such as rumen juice, yeast, silage juice, dried distillers fermentation solubles, and in molasses and cow manure. Reports of work carried on at Ohio State Experimental Station indicate that short chained fatty acids (valeric), in the presence of B vitamins, increases cellulolytic activity. When this kind of research is carried over into practical feeding programs for universal use, a real milestone in ruminant nutrition will have been reached.

▼ ▼ ▼

Pastures for night grazing of dairy cattle should be chosen as carefully as day pastures. Cows graze heavily after morning and evening milkings.